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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
Third Annual Meeting, Texas Gas and Electric Light Association 437

EDITORIALS—
Briefly Told 437
The Third Annual Meeting of the Texas Gas and Electric Light Association—Coal Tar and the Tariff List—Notes.
Proceedings Twenty-seventh Annual Meeting, New England Association of Gas Engineers—Official Report—Revised by the Secretary—Concluded from page 404 438
Second Day, Morning Session—Reports of Gas Leaks: Their Management by a Large Gas Company, by Mr. W. R. Addicks—Discussion—Calorimetry, by Mr. C. D. Jenkins—Discussion—Some Comparisons of Gas Making, from 1853 to December, 1896, and Some of the Writer's Experiences at the Small Gas Works at Fitchburg, by Mr. H. F. Coggshall—Discussion—Votes of Thanks—Adjourned.
A Technical Analysis of Hydrocarbons, Vapors and Gases in Literature and Laboratory, No. I., by Dr. W. H. Birchmore 445
The Recollections of a Country Gas Manager, No. III., by "An Old One" 446
*Schmidt's Electric Gas Lighting Device 447
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 448
Official Notice, Experience Department Pacific Coast Gas Association—Possible Suit Over Electrolysis Damage, Brooklyn, N. Y.—Death of Mr. Isaac S. Cassin—Mr. F. W. Stone Wants to Know—Death of Mr. Daniel H. Keim—Betterments on the Hamilton (Ont.) Works—An Object Lesson in Municipal Ownership—Contract for the Berlin Iron Bridge Company—Opposition Works for Norwalk, O.—Gas Works Proposed for Lonaconing, Md.—Proposed Gas Works for Phœnix, Arizona—The South Amboy (N. J.) Company Reorganized—To Absorb the Arlington (Mass.) Company—Annual Meeting, Red Bluff, Cal.—Mr. Faux at St. John, N. B.—Water Gas Set for the Elizabethtown (N. J.) Company—Death of Mr. John Bailey—Will Ocean Grove, N. J., Have Gas?—Candle Power of Gas in Montreal—Gas Thieves in Chicago—Annual Meeting, Providence, R. I.
Some Details of the Displays at the Recent Gas Exhibition, Madison Square Garden, New York, under the Auspices of the Gas Industries Company.—No. VI. 450
Utah Coal 451
The Market for Gas Securities 451

[OFFICIAL NOTICE.]

Third Annual Meeting, Texas Gas and Electric Light Association.

OFFICE OF THE SECRETARY,
GONZALES, TEX., March 11, 1897.

The third annual meeting of the Texas Gas and Electric Light Association will be held in the Menger Hotel, San Antonio, Tex., on Monday, Tuesday and Wednesday, the 19th, 20th and 21st days of April, 1897. The following papers will be read:

"The Commercial Efficiency of the Incandescent Electric Light," by Mr. H. L. Monroe, Dallas, Tex.

"A Means of Largely Increasing the Summer Sendout of a Gas Works," by Mr. J. C. Lord, Fort Worth, Tex.

"The Storage Battery as an Adjunct to Small Electric Light Plants," by Mr. W. L. Hall, Mexia, Tex.

"A Few of the Many Details of Management," by Mr. A. E. Judge, Tyler, Tex.

"Little Things," by Mr. W. E. Holmes, Austin, Tex.

"Operating Expenses of Electric Light Plants," by Mr. J. D. Oliger, Cleburne, Tex.

"Electrolytic Deterioration of Water and Gas Mains," by Mr. W. A. Fraser, Dallas, Tex.

A few other short papers may be read. The Question Box will be a special feature of the meeting, and it is hoped the Wrinkle Department will also prove interesting.

It is expected, and an effort is being made, to have an exhibit of gas and electrical appliances, which it is believed will be both interesting and instructive.

The last day of the meeting is "San Jacinto Day," a great holiday in Texas, and in San Antonio especially, when the "Battle of the Flowers" takes place.

Effort is being made to obtain cheap railroad rates, and everything will be done to make the expense of attending as light as possible.

The Secretary will take pleasure in sending blank applications for membership and information regarding the Association to those interested.

F. R. STARR, JR., Secretary.

BRIEFLY TOLD.

THE THIRD ANNUAL MEETING OF THE TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION.—From the text of the official circular, respecting the third annual meeting of the Texas Gas and Electric Light Association, as arranged by Secretary Starr, it will be seen that the Association has very wisely concluded to accept the offers made by Mr. Kampman, of the San Antonio Gas Company, for the entertainment of the Association in that city. Mr. Kampman's invitation and offers were duly commented upon in the JOURNAL for March 1st, and what we said then about their sound and convincing fraternality is just as much to the point now as it was then. The Executive Committee not only acted wisely and well in naming San Antonio as the place, but further showed nice prescience in changing the dates of the meeting to April 19,

20 and 21. Heretofore the meetings have been held in May (last year the sessions occurred on May 12 and 13), at a time that caused them, to every intent and purpose, to conflict with the annual meetings of the Western Gas Association, but under the present determination the Texas gas and electric light men have paved the way to permitting many to attend their meeting who could not have attended it had the May schedule been adhered to, because of the conflict of dates. Secretary Starr's circular guarantees a sufficiency of technical matter to render the sessions of solid value, even should the Secretary's hint that "A few other short papers may be read" fail of fulfilment. The list shows that subjects connected with electric lighting are somewhat in the ascendent, but that is natural, considering the preponderance of trouble that comes from the operation of electric light plants as against the operation of gas plants; but the list as a whole is sure to bring out facts worth listening to and thinking over and acting upon. There can be no doubt about the heartiness of the reception that the visitors will have at the hands of the San Antonio Company; and the city, too, at the time chosen, will hold much to interest and entertain those who will make the journey.

Coal Tar and the Tariff List.—The Congressional Committee on Ways and Means has completed the draft of the new proposed schedule of matters dutiable and free, and the gas men have been accorded scant recognition in respect of their claims that a fair rate of duty should be put on tar, pitch and kindred products. In fact, coal tar, pitch and certain other derivatives therefrom are retained on the tables as things that should be admitted free. Of course, the lists have not been made into lawful measures, but a first partial victory—and one that unfortunately promises to be lasting—has been scored by those whose individual interests require free tar and pitch for the advancement of their material welfare. However, one victory does not mean for the first losers perpetual defeat; and if there can by any possibility be brought about a concert of action on their representatives in Congress by the gas companies, it is not a certainty that the tariff schedules in respect of tar and its derivatives may not yet be materially changed. The effort is worth the making; but to be of any quick value it should be made at once. One suggestion that was made to us in this matter, we herewith wish to positively refute: The intimation was made that some capitalists, largely interested in the maintenance of water gas development, were potently, though quietly, active in assisting the tar workers in their efforts to keep gas tars, etc., on the free list. We do not believe there is any truth in the suggestion or intimation; for, however much gas men may differ over the system best adapted for the producing of the goods they have to sell, such differences, to our knowledge, have so far been pointed by open argument rather than by the employment of the methods favored by assassins.

Notes.—Mr. C. M. Higgins sailed for Europe, per steamship Paris, from New York, on Wednesday last. He goes on business, and will be abroad two months or more. His address is "The Anglo-American Oil Company, London, England."——At the annual meeting of the Butte (Mont.) Gas Light and Coke Company the officers chosen were: Directors, A. D. Hopper, A. H. Barret, C. M. Williams, H. L. Frank and A. J. Davis; President, A. D. Hopper; Vice-President, A. H. Barret; Treasurer, A. J. Davis; Superintendent and Secretary, C. M. Williams. During the past five months the Company's send-out has increased al most 90 per cent.—the result of new methods instituted in its management. On March 10th the Company was granted a 30-year renewal of its franchise, which guarantee has determined it to make important improvements on its plant and main systems. A Mitchell regenerative furnace will go into the retort house, and about three miles of mains will be laid. Since November 700 Welsbach lamps have been put in service, and a reduction in the gas rate will likely be ordered next month.——Superintendent Anderson of the East Boston (Mass.) Gas Company is very well pleased over the way in which the new storage holder (capacity, 250,000 cubic feet, constructed by Messrs. Davis & Farnum) performs its work. The output at East Boston shows a satisfactory increase.——At the annual meeting of the Vicksburg (Miss.) Gas Light Company no change was made in the executive management.——On the 15th inst. the Board of Directors of the Portland (Me.) Gas Light Company voted to reduce the gross rate to $1.35 per 1,000 cubic feet, from $1.50. Discounts for prompt payment bring the net rates, from a maximum of $1.25 per 1,000 to $1.05 per 1,000, according to the quantities used each month.——The Committee on Manufactures of the Massachusetts State Senate has reported favorably in the matter of the application of the Commonwealth Gas Company for the right to establish gas plants in the cities and towns of that State not at the present time supplied with gas.

[Official Report.—Revised by the Secretary.—Concluded from page 404.]

PROCEEDINGS, TWENTY-SEVENTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 17 and 18, 1897.

Second Day, Feb. 18.—Morning Session.

The President—The next paper I shall call for is by Mr. W. R. Addicks, of Boston, on

REPORTS OF GAS LEAKS: THEIR MANAGEMENT BY A LARGE GAS COMPANY.

Mr. President and Gentlemen: The Secretary had out his drag net and suggested, if not a paper, a short topic. I made some agreement in regard to a short topic, and, in connection with another matter, I prepared this article, and the Secretary thought it might be of some interest to the Association. I would say that there are a number of forms referred to, which I do not propose to trouble you with this morning, but will simply indicate the system adopted in Boston. If some of the members should be particularly interested in the style of form that we use, I should be very glad to explain that to them personally, but it would be cumbersome to attempt to do anything in that direction to the Association as a whole.

The Organized Forces of the Gas Company.—It consists of (1), the treasurer's and general manager's division; (2), the engineer's division.

Only the second, or engineer's division, is here considered. (2), the engineer's division. The engineer's division is divided into (*A*), the manufacturing department; (*B*), the distribution department; (*C*), the test department.

(*A*), the manufacturing department is sub-divided into manufacturing stations, and each manufacturing station has its: (*a*), gas generating department; (*b*), steam and power; (*c*), purification; (*d*), yard and storage.

(*B*), the distribution department is sub-divided into: First, the street department, comprising (*a*), the main department; (*b*), the service department; second, the jobbing department, comprising (*c*), the jobbing department; (*d*), the meter department.

With this preliminary glance at the entire engineer's organization, I will proceed with the general subject of gas leaks and discuss some of the causes, and the way they are handled by the company employees.

Gas Leaks.—We will consider: First, their management when they occur; second, methods adopted to prevent their occurrence.

First—Their Management.—Gas leaks are reported to the gas company in a variety of ways; the most important are: By messenger sent to the company's office; by telephone sent to the company's office; by letter addressed to the company's office; by police notification; by the gas company inspectors and employees; by the test department; by newspapers and press reporters seeking information; by contractors and other corporations.

The time at which the report is made to the company has no influence, in so far as the prompt attention the company employees give to the report. The report may be made during office hours, between 7 A.M. and 10 P.M., or at night; that is between 10 P.M. and 7 A.M. the following day.

The "management of gas leaks" is best shown by a description of the machinery put in motion by the simple report of a gas leak.

We will consider the case of a gas leak reported by a messenger sent to the gas company's office during the office hours.

The report is received by the complaint clerk, who takes a ticket (form No. 40) and puts thereon all the information obtainable from the messenger. The clerk stamps the time received on the ticket by means of an automatic time stamp. He calls the jobbing department by tube, if the leak is a serious one, and he in all cases sends the ticket up at once by slide to the jobbing department. Immediately on receiving the report a recording clerk stamps the blank by means of a second time stamp; he presses the button of an annunciator, which at a glance tells him just what jobbers are awaiting orders in the waiting room. While the jobber is responding, an entry is made, in a book for the purpose, of the location of the leak, its nature as reported, and by whom reported, and a serial number is placed on the ticket (form No. 40.) The jobber receives the ticket, notes the time he receives it, and proceeds to the premises described on the ticket. As he arrives on the premises he again notes the time and proceeds immediately to investigate the

trouble. His first care is immediate ventilation of the building, removal of all sources of fire and the personal safety of the occupants, then the safety of adjoining buildings, whether a report has been received from the occupants or not; for the trouble, if serious, may have spread to the adjoining premises. If the trouble is very serious the jobber may telephone to the office, or have some one else telephone for him, for further assistance. In such cases one, two or more men are ordered to the scene of the trouble, depending upon the nature of the emergency. While additional help is coming, the first jobber keeps matters safe, without being able possibly to yet locate the exact nature of the fault. If, when assistance arrives, it is found that the gas is coming up into the buildings by defective traps, or through holes in the drain pipes in the cellar, or through the street wall of the building, the office is again notified and the jobbing department notifies the main department (form No. 55) of the street leak, putting the time of notification on this blank. The main department takes note of the time likewise, and a gang foreman, with his men carrying picks, shovels, bars, flag and gate key if needed, respond at once to the call. If the leak is very serious the foreman of the main department goes on the leak as well. While the main department men are on their way, the jobbers are inspecting every house on both sides of the street, 100 feet each side of the premises where the leak was first reported from, and further if any odor of gas is observed thus far. All buildings are freely ventilated and the occupants thoroughly warned in regard to the danger of any lights, or of closing the building until the trouble is found. On the arrival of the main department gang bar holes are at once made, after first shutting the gates controlling the section opposite the trouble, if the situation warrants it, using for the purpose forms No. 44 or 116, as the case requires. The leak being located, one or more holes are dug and the fault uncovered. If the trouble is in the main pipe this gang of men remedy it; if it proves to be in a service, the leak is at once temporarily repaired and the service department is notified, and a second gang of men come with a cart containing pipe, dies, vise and the tools necessary for repairing permanently wrought iron pipe. Full report is made by these gangs on leak report, form No. 2, and on gang foreman's daily report, form 53. If any damage to person or property has been sustained, all departments make special reports, on daily memorandum, form No. 161, and accident blank, form No. 236; all these go to the engineer's office. After all is made safe within the houses the jobbers return to the office and endorse the original ticket, form No. 40, with the facts, and note the time of their return.

This does not yet close the incident. The information on the ticket is entered on the record book, and is now handed to the inspector of leaks. He visits the premises and makes sure that the leak has been thoroughly repaired, and that the odor of gas is disappearing or has left entirely, and that no other and smaller leak has been overlooked. If he finds all right he "O. K's" form 40, and returns it to the office. The foregoing is the method of procedure, if the trouble is coming from a leak in the outside distributing system.

If the jobbers discover, however, that the trouble is coming from the inside of the house they shut off the main cock or otherwise stop the flow of gas. If the company's meter has been injured by accident a change order, form No. 41, is at once made and a new meter replaces the damaged one.

But the trouble may be found in the house piping. In this case, the house being thoroughly ventilated and made safe in every particular, a warning notice, form No. 98, is filled out, and one of three parts of it is given to the occupant. If the leak has been safely repaired temporarily, the gas may be left on; if not, the cock is left shut off. A broken fixture in a bedroom is removed and the pipe capped, or the gas is left turned off if the fixture is not removed. The jobber on his return to the office enters the time on form No. 40, with the trouble described on the back, and turns it in with two remaining parts of warning notice, form No. 98; he now goes to the waiting room, where he pushes his button on the annunciator, thereby indicating on the jobbing office annunciator that he is awaiting further orders. The information on form No. 40 is recorded as in the case of a street leak, and this form is handed to the inspector of leaks, but with it is also pinned one part of the warning notice, form No. 98. The remaining part has been placed on the foreman's desk on a sticker so that it can by no chance be overlooked.

The inspector of leaks visited the premises, and if he finds the defect repaired he "O.K.'s" form No. 40, and on his part of warning notice, form No. 98, he states who repaired the defect, and how it was done. The inspector of leaks now returns both forms properly stamped with the date. This closes the incident. But unfortunately this is not so in all cases, for the inspector finds that owners or occupants are prone to neglect or put off the necessary repairs. Many visits are made by the inspector. I have known in one test case as high as 15 unsuccessful visits being made. When the inspector cannot get the repairs made he reports the fact to the foreman of the jobbing department, who reports it to the engineer's office, and a circular letter, form No. 139, is mailed to the person interested.

This is far as the company can go, unless it shuts off the supply of gas arbitrarily. This is an order that must be seldom given, as great inconvenience is caused by it. In many cases improper fixtures have been in use for years, and with care they may be safe; but they only lack the time and circumstances to be the cause of an explosion or other accident. As stated before, a broken fixture in a bedroom when found is removed and the pipe capped, or, if the occupant prefers, the gas is turned off. Beyond the gas company's property, it has no power to enforce repairs.

All of the above refers to the machinery set in motion by day. That at night is similar except in a few particulars. The office door is open every week day, between the hours of 7 A.M. and 10 P.M. All day Sundays, and after 10 P.M. other days, the front door is closed, but there is to be found at the door a push button and a speaking tube which will always bring response to a call.

A call by telephone by day is always received by the jobbing department direct, and is so much the quicker. A telephone by night is answered by the night watchman. At 10 o'clock a switch on the telephone is thrown which puts in circuit a drop shutter. This governs a large 9-inch gong on the third floor landing and a smaller one in the basement. When the telephone rings, the shutter falls and thereafter these gongs, which can be heard from the fifth floor to the cellar, continue to ring until the watchman goes to the telephone and puts up the shutter and takes the report. At the office sleep five jobbers ready for night work, and also the foreman of the main department. In the basement are stationed the night foreman of mains and a force of men connected with the main department. In a company house, at Park Square, sleep the superintendent of the street department and the foreman of the service department. At the other yards and offices are other men, either on active all night duty or, by means of telephone with extension bells to their bedrooms, they may be summoned at any time for duty. Emergency work is principally concentrated in the city proper, and of late years in parts of Roxbury. At night our men break into buildings in the presence of a police officer when necessary.

The machinery is always ready for immediate motion; this fact is so well-known that many who want a burner cleaned promptly, report a leak to the office to effect their end.

On the other hand, in cases of many serious accidents the company is not notified for many hours; long after the care always exercised by the company employees in of no longer the same value. In several serious cases the first knowledge the company has had of trouble has been the visits of press reporters for details of the accident. This is by no means an unusual case. I will now devote some space to the means adopted to prevent leaks occurring.

The Prevention of Leaks—Precautions.—Commencing with the new mains as laid, the test department tests such mains and reports to the engineer, on form No. 9. This is done by utilizing the valve system, which Boston alone of the large cities possesses, a system the result of the great Boston fire. A gas meter with dial indicates, by one minute's observation, the rate of leakage that is taking place in one hour, from the section of the new main under test. When this test system was first put in service we had a standard leakage permissible. It was found that mains and joints could be made absolutely tight even to the large sizes. That foreman who cannot now lay his mains tight, may as well resign his position. The moral effect is very great in the interest of good work and of care in little things. All services are tested before being covered up, and an inspector examines their condition, inside of the front wall of the property after they have been placed, to see that the pipes are properly disposed and wall cemented.

So far the work is readily supervised. In addition the company has inspectors who do nothing but inspect the piping of buildings, reporting on form No. 43. These inspectors insist that the pipes shall be a scale, that the spaces left for the meters are properly located, and they insist upon all provisions contained in form No. 16. The influence is only a moral influence, however, by the gas company refusing to place a meter where its requirements have been violated. This does not prevent the owner doing what he sees fit after the meter is set. The inspector observes the pressure put on the pipes by the contracting fitter which is 15 or 18 times the highest pressure that the gas will exert. This test is made on the pipes and fittings only, without the fixtures. The strain put on the pipe and fittings by gas pressure is but ¼ of 1 per

cent., and what similar pipes when used in water or steam have to withstand. The test develops any careless joining of the pipes and fittings, sandholes and nails driven through piping. After this test the fixtures are placed. If defective fixtures are noted, the meter is not set until they are cared for. In cases of remodeling of buildings, or extension known as "Formerly," the inspectors go over the house and see that old fixtures are not defective. If a meter is set and any defect is noted, then the gas is left turned off and a tag is left on meter, reading: "This meter must not be turned on except by the gas company." When an order is given to turn on a meter, all the pipes having been tested and the fixtures being on, a jobber is given a ticket, form No. 42, or form No. 39, as the circumstance requires. He inspects the entire building for leakage and in addition carefully notes the meter's testing dial hand a given length of time. This dial hand is only used for this purpose and that of testing the meter for correct registration, and not for the purpose of making out bills for gas used through the meter. The length of observation depends upon the diameter and the graduation of the dial. Unless the jobber can get access to every fixture and every room in the house he will not turn the gas on. After gas has been on the pipes of a building for years and the occupant can proudly say, "Why, I have used the gas through these same burners, fixtures, pipes, etc., for 40 years," is where the difficulty comes.

We will now consider the further duties of the test department and the special examinations form, No. 20. Whenever the street department of the city of Boston resurfaces or repairs a street a notice of the fact is given to the gas company. The test department goes at once with the test meter, shuts the valves at either end of the street, after notifying the consumers. If after inspection the lights and stoves are found turned off and the test meter still passes gas to the otherwise isolated section, then this amount is leakage from pipe joints, or services. Barring is at once resorted to and the work is continued until the meter shows no gas leaking on this section. When leakage is found existing the street department is notified of repairs being necessary, and on completion it is notified of that fact.

The test meter is similarly used in the case of great fires. No gas is turned on a main till the meter indicates no leakage. In the case of the Ames Building fire two broken mains and several broken services, caused by falling walls, were discovered after all superficial examination failed to find anything wrong. The old way was to let the gas develop in the ground and then seek the trouble. The report of every new service that is put in a street and every service relaid constitutes a source of information as to the condition of the main pipe at that point. Thus track is kept of the condition of the underground system, and the street, after resurfacing, does not need to be disturbed, unless a steam roller fractures the pipes, starts the joints, or the pick of some workman penetrates a service pipe and receives a wooden plug, without notifying the gas company of the defect. A tap and iron plug would soon effect safe repairs.

The cause of leakage in the underground system is made ground, or its equivalent, digging below the pipes and then not properly filling the trenches. Settlement of the ground starts the joints, and, if excessive, breaks the heavy cast iron pipe. The gas pipes are as heavy as the water pipes used in Boston high service, though the water pipes are subjected to a pressure of 75 pounds per square inch, and the gas pipes ½ of 1 pound; or, the pressure of the water is 675 times as great as that of the gas. Troubles arising in mains and services are failure in joints, breaking of pipes, mains settling and filling with water. Leaks develop in services by failing joints, by fracture, rust-outs, electrolysis, burn-outs, by the underground electric light, etc. Frost or naphthaline stops up the pipe, or settlement causing pipe to fill up with water. Stoppage occurs to the service by rust also. All these faults being underground, experience is required to diagnose each case.

Inside piping is subject to all the trouble that underground pipes are, except that rusting out is confined to a greater extent to the cellars.

Very early in my Boston experience I saw the necessity of preventing the serious inside leaks, caused by rusting out of wrought iron pipe. When a wrought iron pipe rusts, it frequently rusts uniformly, until there is a mere shell of pipe. A thickness as thin as paper is strong enough to hold gas in, provided it is undisturbed. Under these circumstances it is very difficult for the jobber to get any portion of the pipe to hold together so that it may be even temporarily repaired.

To take care of this point of weakness, the special examination, form No. 20, was devised, and several special inspectors were detailed to cover the city and examine specially every service pipe, every pipe to the meter, every meter, every governor and every riser, as far as it could be seen. Each defect found was at once remedied, if it was in the property of the company, and if otherwise a warning notice was served on the owners and occupants; the inspector of leaks following up these cases the same as leaks regularly reported at the office. The good effect of this action was at once felt. Since the first year (the oldest part of the city was taken up first) the leaks in inside services have been from accidental causes, such as settlement of floors, throwing heavy merchandise on the pipes, or some such cause. The gas company has the right of access for this special examination of the meter; but here its rights end. The company has no right to examine an entire house for defects and compel the owners to take care of fixtures worn out by use. If such action was taken it would soon be misconstrued and subject the companies to unjust and thoughtless criticism. Many of the regulations of the company are objected to now as arbitrary; and still they are for the general good of all concerned.

I think the one unguarded point is the one beyond the control of the companies, and owners are loth to make right defects that should be taken care of at once.

The inspector of leaks has done wonders in taking care of defects that had been reported year after year and many times a year; leaks that the company employees had soaped up time and again, notifying the tenants to care for the defect, only to have the soap dry and be dislodged and the leak to be reported again.

The systematic written notification, and following up of the notification by insistence on proper repairs, successfully cared for these well known cases.

Other precautions adopted are the constant working of the valves throughout the city, and where large undertakings are going on, the mains that can be spared, after the large winter business, are shut off until the work is completed. In special cases an inspector is detailed to keep all building and other material from off the gate boxes, ready for emergency.

All fires are attended by an employee of the company, who reports to the Chief Engineer of the City Fire Department, and second and third alarms of fire are answered by the foreman of the main department with a gang of men from his department.

In conclusion, I am a firm believer in systematic and conscientious and thoroughly supervised inspection. Each man's work coming under the personal eye of the chief and each man's work so thoroughly shown by having a printed question for every answer desired, on a form which is thorough throughout, to fit all possible cases. In addition, have the duties of each man crossed at some point by the duties of some other unknown to him. The two stories must exactly agree at this point or be subject to further investigation. In every case of accident would be found a very simple cause if he could get at the facts in the case. That cause would be found beyond the control of the corporation most desirous of preventing the trouble.

Discussion.

The President—Mr. Addicks is ready to discuss any point in the paper with any gentleman who may wish to debate it with him. When Mr. Snow read his paper yesterday on "Gas Distribution," we had quite a discussion in regard to different styles of pipe—wrought, cast, steel and fiber pipe, and also in regard to cement joints, lead joints, etc.; that discussion was before the intermission of yesterday. I stated to some of the gentlemen who asked me to allow it to go on that, after the intermission, this paper was to be read by Mr. Addicks, and that further talk on these subjects would be taken up at this time. It is very proper to consider them now. Mr. Addicks has had experience in a large way with different kinds of pipe and different kinds of joints, and would be very glad to answer any questions any of the gentlemen may put to him. I do not wish it understood from what I have said as regards the number of papers, that I wish to close the discussion. There is time enough for discussion on all the papers. We shall be very glad to have this question opened and most thoroughly discussed.

Mr. McKay—I would like to ask Mr. Addicks if he will state the system used in blocking in mains laid in Boston; and I would like to know if, with this paper, we could not have published a cut of the Addicks test valve.

Mr. Addicks—In regard to the Addicks test valve, it is a misnomer. It was a matter which was reported on by a committee of three—Mr. Learned, Mr. Prichard and Mr. Addicks. As regards blocking, Mr. McKay has, intentionally probably, touched upon a point which is a very important one in laying gas mains, and which I have no doubt will bring about a very active discussion. The question of blocking in large mains, I presume, there would be little difference of opinion about; but the question of blocking in small mains has been discussed, and we have been trying both the usual method of blocking and also of pounding the earth thoroughly in place of using wood for blocking.

Of course, after a length of time the wood will doubtless rot out unless there is moisture present, and will leave a cavity under the pipe at that point, which will subject the pipe to a strain, not serious possibly, unless there is some further cause. That, I say, is under trial, but only on small sized mains. I think the question of lead joints and cement joints will govern one as to the results that will be obtained in the two methods. In regard to lead and cement joints, of course, with the number of companies we had in Boston, there were a number of different systems. We have finally adopted the system of having the same number of lead joints in both the city and suburban districts; and we make a difference in the weight of pipe. The old Boston Company laid 6-inch pipe as heavy as 460 pounds. We do not do that now. I think it is entirely unnecessary. But when a spot of ground is as bad as that, wrought iron pipe is put in. In the suburban districts the pipe is of the weight of that usually put in by gas companies; that in Boston is considerably heavier. This is possibly a little beyond the question asked; but it has some influence, I think, on the blocking question, and I trust there will be some discussion on that line, Mr. President.

Mr. McKay—I spoke of this valve because it seemed to be a very efficient test valve; and if we can get a cut of it under the name of the committee or any other name, I think it will be a very interesting illustration for the paper.

The President—I should think it would be an excellent thing, as long as this matter of pipes has been so fully written out and is to be printed, that is, if Mr. Addicks is willing, and if the other gentlemen associated with him in connection with the valve are willing, that they should print a cut of the valve with the paper. I do not doubt Mr. Addicks will be willing to see it is done.

Mr. Coffin—I think every membr of the Guild had a blue print of both styles of valve sent to them for any comment or suggestion they might make on them; and they finally voted, I think, for a valve a little longer than usual.

Mr. Addicks—I think it was the other way; it was a short one. If I may explain that, possibly, in detail, the chief change was that the pipes came up through the flanges of the valve. The bells previously were very far, in the test gates, from the side of the valve. Being very weak, they broke continually with us in Boston. I think I brought up the question originally, and then they took it up in the Guild. We had tried to strengthen the bells by putting heavy flanges under the valve; and finally it was considered by the Guild best to reduce the entire length and strengthen the valve by putting the test pipes through the flanges. The reduction was something like 5 or 6 inches.

The President—It seems to me that the simplest way to do this will be for the AMERICAN GAS LIGHT JOURNAL to print, independent of the paper, an illustrated description[1] of this valve That perhaps would answer the purpose better than any other way. If any gentleman has any question to ask of Mr. Addicks about pipe, joints, leaks, etc., now is the time.

Mr. Learned—Did I understand Mr. Addicks to say that he simply tested his new work? Or does he make a systematic inspection once a year of his old work with these test valves?

Mr. Addicks—You will readily understand, Mr. Learned, that, in a large system like that in Boston, it is very hard to cover the entire district. You will also remember that in Boston the macadam streets are usually resurfaced within a definite time, particularly in the city, and it is in the city where we have our principal leaks. We depend upon those resurfacings to a great extent, as routine work, to be sure that at that time everything is in perfect condition by the tests. Beyond that it would depend entirely upon the amount of work in the department. But they are done from time to time as required, or whenever there is a leak reported on the street that the street department have difficulty in locating promptly.

Mr. Egner—I would like to ask Mr. Addicks about the average depth at which he lays his mains; also, if he has naphthaline—he may not have, I hope he hasn't—troubles, what means he employs to clear them?

Mr. Addicks—The average depth of the main in Boston is 3 feet. Of course, that depth depended in the old times on the depth of the water pipes. A number of years ago they increased their depth 6 inches, I think; but the old system would prevent any increase in the depth of mains here. The means adopted for the freeing of the ordinary stoppages are the usual methods. I would say that for years we have had very little trouble. Mr. McKay has hinted at a reason for that. We adopted also a system that freed us from a great deal of trouble. When any service was complained of during a winter twice for a stoppage for any cause, if that service was a small service it was relaid the following spring, and we haven't heard from those again.

1. This matter is in preparation.—Eds. A. G. L J.

Mr. Neal—The practice of the Charlestown Company is this: If any leak is reported, night or day, it must be attended to at once, for the reason that we may be held harmless in case of an accident, by explosion or otherwise. And I presume that is the reason the Boston companies which Mr. Addicks represents are so particular to keep a record of the notice given, the time of notice, the time the work has been attended to, in order to free themselves from liability. I have a volume, published by Mr. Charles P. Greenough some years ago, which contains the decisions of the courts in relation especially to cases concerning gas companies, and one of the decisions is this: If a leak is reported and the company sends its agents and attends to it promptly, if an explosion or an accident occurs from that leak, the company is held harmless.

Mr. Addicks—I think that is so.

Mr. Neal—The decisions are very good as far as the company is concerned, but sometimes it seems to work an apparent hardship upon those who may suffer through explosion or accident caused by leaks. And so, in Massachusetts at least, and perhaps in other New England States, if a leak is reported it becomes the duty of, and it is in the interest of, the company or those who have it in charge, to attend to that leak promptly, night or day, Sundays or week days, in order that they may, in case of accident resulting from such leak, be relieved from any responsibility for damages.

Mr. Woodward—If I understood Mr. Addicks correctly, he stated they were now using the same number of lead joints in the city district as they were outside. Will he tell us about what proportion of cement joints he makes to lead joints, and, briefly, how those cement joints are made; whether he uses neat cement, and what proportion of sand he uses? That was brought to my mind in connection with a paper Mr. E. C. Jones read some years ago. I had a little curiosity to know if the same custom is followed in Boston that prevailed several years ago, and what their experience has been in that direction.

Mr. Addicks—I should have put the statement in this way: We now make the same number of lead joints in suburban districts that we do in city districts. The proportion is, ordinarily, two cement joints to one lead joint. The cement used is a clear cement, and that has always been used in Boston, to my knowledge, and by the suburban companies, with the exception of South Boston. I do not know whether that fully answers the gentleman's question or not.

Mr. Woodward—I could not quite hear it. I understand you to say you are using altogether neat Portland cement?

Mr. Addicks—I did not say Portland, although we are at the present time using the Portland. The proportion of the Portland cement would vary somewhat with the season.

Mr. Woodward—But it is neat cement?

Mr. Addicks—No; sand with the cement.

Mr. Sherman—I would like to ask Mr. Addicks what is the smallest size of service he puts in in Boston, and whether he uses steel pipe, iron pipe, or galvanized pipe? That is a question which is agitating a good many of the gas managers at the present day.

Mr. Addicks—The smallest size of pipe used in Boston is 1¼ inches. That was taken for the reason that it is lap-weld pipe, and it is the smallest size that is made lap welded. You also may remember that the discounts change on the 1¼ inch, and the difference in price between the 1¼ inch and the 1¼ inch is not very great. I don't remember the exact amount. We have always ordered iron pipe, though I discovered that at one time the manufacturers were furnishing steel pipe. I have heard a good deal in favor of the lasting qualities of steel pipe, but I was not thoroughly determined in my own mind as to whether we should use steel pipe or not. Of course, it is harder on the dies, so I felt compelled to retain iron pipe. We then met the difficulty of light-weight pipe, very much lighter than the list pipe. At the present time we are having pipe made especially for us, of full weight. We do not use galvanized pipe, but we coat the services.

Mr. Sherman—Is your experience in the use of valves such that if you were going to a place as large as Boston or larger, and they had not adopted these valves, you would feel warranted in asking the company to be at the expense of gating the city?

Mr. Addicks—The gentleman asks me a very large question. If I were going to a company, and they had just invited me to come, and I asked them to spend $250,000 for valves as a starter, it might possibly produce a poor impression. The system in Boston was in use before I came here, as you all know; and it was then utilized in the direction of testing, copying some of the gentlemen in New England. Of course, everything being done so thoroughly, it would be a very great mistake not to keep it up, as it does not now take very much money. I would say that in every case that I have examined carefully, the labor of find-

ing the leak was paid for in six months, the saving in the former loss of gas paid for the expenditure in six months; and that is, I should say, the general experience. I think, if I were going to another city, I might be governed somewhat by the actual leakage in the city. But if I were to deliberately seek for leakage, I certainly should put the valve system in use and be governed entirely as to how far it should go by the conditions. I wouldn't like to say that any city should go and pay several hundred thousand dollars offhand for a valve system.

Mr. Anderson—Mr. Addicks states that a 1¼-inch service pipe is the smallest pipe that he uses. I would like to ask what his smallest mains are, and what size of hole he taps for a 1¼-inch service; if he taps it the full 1¼ inch, or reduces at the main. He also spoke about protecting the service pipe at the wall. I would like to ask him what means he adopted in protecting the service pipe where corrosion takes place at the wall?

Mr. Addicks—The smallest sized main I remember in Boston is 2-inch cast iron, or rather, it isn't in Boston proper, but in the suburban districts. We usually take those up. No main is laid less than 4 inches in diameter, except in special cases. In that case we use wrought iron. The tapping is ¾ of an inch for a 3-inch main, an inch for a 4-inch main, 1¼ inch for a 6-inch main, and 1½ inches for sizes above. As to the protection of the service, I simply said, after the service department had finished their work, an inspector was given a service blank, and he inspected that service as to whether the pipes were properly disposed. We do not care about having our pipes right alongside of electric pipes, for instance. If a service foreman should do that, his attention would be called to it; and if he had not cemented up the wall properly, his attention would be called to that. In regard to the corrosion at the wall, which you all know is very serious, the practice has been to put in a coupling out in the sidewalk near the edge stone—at least it has been so in later years—as well as a coupling near the main; so in case of a larger connection being required, they could disconnect the coupling at the main and do the work on the service without disturbing the rest of the pipe. And also, in case of a rusting out at the wall, they could do that readily without disturbing the street. I will say we have under consideration the use of extra heavy pipe where it goes through the wall. The doubtful thing in my mind is whether, due to the extra strength at that point, there would not be more breaks where the coupling was near the wall, rather than as now, at the rust at the wall; in using extra heavy pipe it would naturally break between the strongest and weakest points—*i. e.*, the thread where the standard weight joins the extra heavy.

Mr. Fowler—Mr. Addicks has had so much experience in Boston in the system that a question occurs to me which possibly he may not wish to answer. I suppose he has lately come in charge of mains laid by a company where he did not have the oversight of the laying of those mains. I would like to ask him whether those mains are valved, and, if not, whether they are to be valved.

Mr. Addicks—The gentleman very properly qualified his question. (Laughter.) I might be in the position that Mr. Greenough was once in. I need not hesitate, however, to say that the system of the Brookline Company was not valved at the start; but very early in their experience they thought wise to put the valves in, and they are quite thoroughly valved: I presume, in certain parts of the city, as thoroughly valved as the Boston pipes are. And they naturally took that question up and met it, as Mr. Sherman suggested in his question as to whether I would valve a city. Where it was required, that is, where they found, owing to the conditions of the ground, that it was required, they put in a great number of valves.

On motion of Mr. Anderson a vote of thanks was passed to Mr. Addicks. The President introduced Mr. C. D. Jenkins, Inspector of Gas and Gas Meters for the State of Massachusetts, who read the following paper on

CALORIMETRY.

Gas inspectors are especially interested in the quality and properties of your finished product. My predecessors having devoted themselves to improving the methods and apparatus for the chemical testing and analyzing of gas, the testing of meters and meter provers, and strug gling with the ever present problem of candle power, apparently did little with heating power. From the increasing use of gas, the standard illuminating gas, for fuel purposes, it would seem that there might be use for a series of practical determinations of the calorific power of the various gases; and this is what I hope to reach in time. Heretofore calorific power has generally been calculated from the result of a more or less accurate endiometric analysis; in laboratory work some form of the explosion calorimeter has been used, but is objectionable from the fact that the results are obtained under conditions of constant volume, the unportable character of the apparatus and the comparatively small volume of gas used. In the Junker calorimeter the gas is burned from a Bunsen burner, under constant pressure, in a chamber surrounded by H_2O, in which is a large number of thin copper tubes, through which the products of combustion pass. The water flows through the apparatus in a direction opposite to that of the hot gases, and is supplied at a uniform pressure and rate. Now, if we burn *in the apparatus* gas at the temperature of the room, and have the exit or burnt gases also at the room temperature, all the heat from the combustion of the gas will be found in the increased temperature of the water. It is only necessary to carefully measure the gas used, the amount of water heated and the temperature to which it is heated; the heat units are easily figured from this data. As hydrogen burns to water allowance must be made in the results obtained, for the latent heat given out in the condensation from vapor to liquid; the apparatus is so constructed that this water can be collected and measured.

I have used the apparatus with hydrogen containing 0.37 per cent. nitrogen with the following results: 0.419 cubic foot gas saturated with moisture at 30 inches and 60° F., heated 2 liters water from 24.22° C. to 40.86° C., giving thus 315.2 B.T.U., calculated to dry gas at 30 inches and 60° F. This gives 326.8 B.T.U., as against 328.8 by Berthelot. As 20.46 c.c. water was condensed from the burnt gas the available units, as generally the water formed goes off as steam, would be 271.8 B.T.U. The B.T.U. being the amount of heat necessary to raise the temperature of 1 pound water 1° F.

Newton gas: Candle power, 17.2; specific gravity, .421.

Inlet.	Outlet.	Difference.	Corrected Gas.	Cal.
15.81	33.62	17.81	.2163	164.6
15.78	33.51	17.73	.2167	164.1
15.59	33.25	17.66	.2138	165.2
15.41	33.30	17.89	.2159	165.8
15.93	33.92	17.99	.2172	165.6
16.08	34.11	18.03	.2180	165.4
16.00	34.05	18.05	.2198	164.3

Average cal..... 165.0 = 665.2 B.T.U.
H3 cc. cond. H_2O... 14.1

150.9 = 599.2 B.T.U. net.

Fig. to 32° dry atmospheric pressure.....644.2 B.T.U. net.
Theoretical from analysis dry 30″ and 60°...661.6 B.T.U. gross.

Net B.T.U., saturated, at 60° and 30″:

			Candle Power.
Boston	681.8	....	25.0
South Boston	634.8	...	24.7
Cambridge	576.0	....	17.0
Boston	689.7	688.6	25.7
Newton	599.2	605.6	17.2
Charlestown	613.6	617.3	17.8

Analysis—

	Boston.	Charlestown.	Newton.
Candle power	25.7	17.8	17.2
Specific gravity	.673	.507	.421
Illuminants	15.55	10.42	5.23
CH_4	21.44	28.63	34.80
H_2	30.29	42.80	50.59
CO	26.90	13.93	6.16
N_2	3.06	2.03	2.06
O_2	....	....	....
CO_2	2.76	2.19	1.16
Condensity	C..2.51 H..6.88	C..2.31 H..5.18	C..2.91 H..5.63
B.T.U	2,154	1,794.8	2,357

Discussion.

Mr. Learned—Mr. Jenkins in his paper said something about the perfect gas of 25 candle power. I didn't quite catch it all—the last of it. (Laughter.) And one thing more. That gas that you were experimenting upon, of course, you understand was straight coal gas, with benzol alone; no enrichment of any kind excepting benzol. Could you also give the Association what you find in a straight coal gas enriched either with cannel coal or with oil; or does that appear in your annual report to the State? I want to get the facts, that is all. And also, at the same time, have you there an analysis of our gas?

Mr. Jenkins—I did not read all the figures that I hope you will kindly publish. If anybody cares to read them, I have here the analyses of the three gases whose heat units I read, which are the three I recently finished and which are in the report. The heat units, the analysis and the theoretical units for the illuminants. I also have here

some I had made previously, and one of some Cambridge gas. I do not know whether that was a straight coal gas or a coal gas enriched with oil. I would like to say that it would seem to me—and I hope it is right—that the proper standard to use in getting these heat units is to consider our gas saturated with moisture under the conditions of 30 inches barometric pressure and 60° F. And these units are under those conditions, and are the net units. Do you want the analyses?

Mr. Learned—No; not if it is in print. I did not know you had it.

Mr. McKay—Mr. Jenkins speaks of aqueous vapors, but has he paid any attention to the condensable, oily vapors, which are not disclosed by an analysis, that exist in the gas?

Mr. Jenkins—Mr. President, I have not analyzed the water that we obtained. I assumed that all the vapors in the gas had been burned. Does that answer your question?

Mr. Nettleton—I would like some information. I am not thoroughly familiar with this matter of heat units, or with the apparatus, and very likely I shall disclose my ignorance on the question; but I understood Mr. Jenkins to say that good coal gas as made at Cambridge of 17 candle power, enriched by oil, shows less than 600 heat units to the foot, and the "perfect water gas," in Boston, of 25 candle power, showed 620 or 630?

Mr. Jenkins—680, I think.

Mr. Nettleton—At the present time we in Connecticut are very much interested in heat units; and I had the impression, from information in my possession, that the heat units of illuminating gas were very much greater than those stated by Mr. Jenkins, and I am bitterly disappointed if he is absolutely correct. I have in my possession, or have here before me, the figures of an analysis made by people who are to be relied on, which show results like these: A 16-candle power coal gas, specific gravity .420, gives 664 heat units; and a 25-candle power water gas, specific gravity .665, gives 766 heat units. The difference between the figures quoted is nearly 100, I think.

Mr. Jenkins—In reading a little bit about the heat unit question, I find a great many standards have been used; and if I have any good fortune at all in getting a series of results, as I hope to, I want to have them all at some convenient and practical standard. I find that the heat units are given variously, for gas saturated with moisture at 60° and 30; for gas dry, at 60 and 30; for gas dry, at 32° F. I think very probably the results Mr. Nettleton speaks of, of 700 or 800 for 25-candle power gas, may be for dry gas at 32°. I would like to be advised if I am wrong, but the standard that I have adopted is, saturated gas, at 60 and 30, in order to have the results not misleading, if they are figured on for practical use. Does that answer the question, Mr. Nettleton?

Mr. Nettleton—Yes, sir.

Mr. Addicks—Mr. President, may I suggest to Mr. Nettleton to have other gases, without specifying which ones, subjected to the same test? Possibly he will find the figures are absolutely correct, and the data are variable.

Mr. Gifford—A question I would like to ask Mr. Jenkins is: If, in a general way, his work has shown that heat values calculated from analyses and those obtained from actual experiment with the calorimeter are nearly alike; that is, near enough for ordinary working?

Mr. Jenkins—When you speak of calculating heat units from gas analyses, I think it depends very largely on the data you use for heat units and the particular gases, and also largely on the character of the analyses. I have seen a good many analyses of gas that you have to figure out very largely in excess, in heat units, what you would if they were tested practically. And that is one reason why I would like to make a series of tests practically on the heat units, in order to get some more or less reliable data for reference.

A vote of thanks was passed to Mr. Jenkins; and the President asked Mr. H. F. Coggshall, of Fitchburg, Mass., to read his paper entitled

SOME COMPARISONS OF GAS MAKING, FROM 1853 TO DECEMBER, 1896, AND SOME OF THE WRITER'S EXPERIENCES AT THE SMALL GAS WORKS AT FITCHBURG.

Mr. Coggshall—Mr. President and Gentlemen: I owe the Association an apology for the paper I am about to read, and the only thing to commend it is its brevity. Mr. Prichard wrote me to know if I would write an article on some subject connected with the gas interests. I told him I did not have much time, and further remarked if I had anything to say it might be merely on some comparisons of service. In that light I wrote him I did not think such matters would form a paper that would be interesting to the fraternity or beneficial. However, he wrote me back it was what he wanted, and that it was my only opportunity to get acquainted with the members of this Association and for them to get acquainted with me. Had I been buying stocks, and a man said that to me, I should have said it was a bluff, and I would have waited; but I fell into that trap, and I submit to you what I have gathered together.

Forty-four years ago, last January, the elder Mr. Odiorne came to Fitchburg, then a town of 3,000 or 4,000 inhabitants, and enlarged upon the benefit to the public that it would be to erect gas works in that town, and how profitable it would be to the stockholders. Well, they did not enthuse very much on the subject. The President of the Railroad Company in which I was employed took quite an interest—more interest than anyone else—and called a meeting together later, to see how much stock would be subscribed. The result of all the united effort was $5,000. He took $1,000 of it and I took $500; and the rest was made up in sums from $500 to $100. A charter was granted, giving the right to issue stock to the amount of $100,000, par value $50 a share; and we went to work.

The gas works were erected in Fitchburg in 1853 by parties who had no practical knowledge of gas making—their information was wholly obtained from books upon the subject. The contract for the works was given to Mr. "B.," as he was the only man who would erect the works on our specification and estimated cost of same, viz., $40,000, and take the $5,000 we had already subscribed and the balance in stock. Mr. "B.," who was building works in another town in Massachusetts, wanted the writer to take charge of the work, and when completed, as he knew more than anyone else did (and that was saying but little, as he had no practical experience in gas making), he was selected Manager.

The works consisted of retort house, 35 feet by 24 feet, two benches of 3's, iron retorts, 8 feet 12 inches by 20 inches, and would burn off 150 to 200 pounds of coal to the charge. Flat box-washers, 3 feet by 3 feet by 18 feet, purifying house with four purifiers, 4 feet by 6 feet, station meter, holder, 50 feet by 16 feet, open to the weather. Wet meters were in use for all consumers. Pictou coal was the only coal to be had in those days. Would make about 2½ to 3 feet to the pound, of 12 to 14-candle gas—there was no law as to candle power in those days. With the above apparatus and material for making gas, fire was started under one bench.

On the 16th day of December, 1853, the good people of Fitchburg were supplied with illuminating gas, and from that day to this they have not failed of a supply, though they have had some close calls.

In the spring of 1854 a great gale of wind took off the roof of the engine house, near the works, which fell on to the gasholder, smashing it in.

I had the inlet pipe disconnected and made connection with outlet pipe to the street and supplied gas direct from the retorts until we had the holder repaired. There being but a small quantity used, by running both benches of 3's, and using resin freely, I was enabled to supply the consumers fairly well.

A little episode occurred during this time. A dance was being held at the Fitchburg Hotel, and just as we had taken our places with our partners on the floor, the gas went out, and the hall was in darkness. Supposing the trouble was that they had just charged at the works and the extreme pressure had filled the dry well with water, I went down, drew out the water, went back and lighted the gas, and all were happy again. The following season a building was erected over the holder, and no more of such trouble has occurred since.

In 1856, owing to faulty construction of the drips in the purifying cellar, two deaths occurred, the only ones since the works were started to date. Instead of running drip pipes from purifiers into a tar well, they were sealed by lead pipes soldered up at lower end, which were about 2 feet long and were hung over the purifying pipes with iron wire. One of them had rusted so that it broke and dropped into the tar well and let all the gas out of the holder. This occurred in the night, and when I went down in the morning there was no gas in the holder and the fires were all out. I found the two men dead, and the wife and child of one of these unconscious in the purifying cellar. I knocked out the windows in the purifying cellar, sent for a doctor, got some help and took them out. Was successful in bringing the wife and child to consciousness, but the men had been exposed to the gas so long that they could not be brought to.

Dec. 15, 1853, to April 1, 1855:

Sales 1,611,800 cubic ft. at $4 per 1,000		$6,447.39
Coke sales		165.39
		$6,612.78
Makes loss of		115.10
Expenses were	$6,727.88	$6,727.88

April 1, 1855, to April 1, 1856:

		Sales 1,665,300 cu. ft...	$6,661.58
Expense.....	$4,989.23	Coke sales.....	216.84
Net.....	2,019.69	Other income.....	31.50
	$6,909.92		$6,909.92
			No tar sales.

April, 1856 to April, 1857:

		Sales 1,680,400 cu. ft...	$6,721.69
Expense.....	$4,666.74	Coke sales.....	281.71
Net.....	2,358.86	Other income.....	22.20
	$7,025.60		$7,025.60
			No tar sales.

April, 1857, to April, 1858:

		Sales 1,491,900 cu. ft...	$5,967.98
Expense.....	$4,063.17	Coke.....	49.58
Net.....	1,988.29	Other income.....	33.90
	$6,051.46		$6,051.46

April, 1858, to April, 1859:

		Sales 1,748,000 cu. ft...	$6,991.79
		Coke.....	91.73
Expense.....	$4,208.76	Tar (first) sales	36.37
Net.....	2,969.53	Other items...	58.40
	$7,178.29		$7,178.29

Paid first dividends and have always paid dividends.

Before paying first dividend I had bought every share held by outsiders and placed them with our consumers.

The output at first was about 3,000 feet per day, and increased gradually to 10,000 feet in winter; but up to 1867 the output in summer was only 6,000 to 7,000 feet, and 22,000 feet in December. In the summer months, at first, could not make enough gas to supply coke to run the bench, so took out one of the benches of 3's and put second arch inside the other to take one retort, running this for several seasons. In 1862 we discarded iron retorts and put in clay retorts imported from Belgium. This was the first step forward to better results. We used Lingan coal, getting 3½ feet to the pound. Previous to 1865 wet meters had been used, but the price of whiskey had advanced so much that it was economy to discard the wet meters and replace them all with dry meters. In July, 1867, we commenced using Glace Bay coal, producing 4 feet to the pound; but on account of the large quantity of sulphur we were obliged to change purifiers 22 days out of every 30 in winter, using lime for purifying.

In 1870, were still using Glace Bay coal, with yearly yield of 4½ feet; cost of coal was $9 gross ton, delivered at shed. In this year we adopted the Gibson valve for dip pipes, and the average production was 4.32 ft. to the pound of coal. In September the coal took fire in coal shed from spontaneous combustion. Called two steamers and pumped water on all day; the water was at first boiling hot but we continued pumping until it left the shed as cold as the river water—no more Provincial coal for this Company.

Commenced using Despard and Newburgh orrel, producing 4.30 ft. to the pound. In 1870 the send-out was 5,800,000 ft. In '71 we discarded the bench of 3's and erected stacks for benches of 5 retorts. In 1875 the send-out was 8,400,000. In '73 we put in an exhauster, which was the second step of progress. In 1876 the send-out was 7,600,000 cubic feet.

In 1880 we used Youghiogheny coal; gas send-out was 9,300,000 cubic ft., with an average production of 5 cubic ft. per pound.

In 1885, gas send-out, 11,600,000 cubic ft; average yield, 5 ft.

In 1890, gas send-out was 17,200,000 cubic ft; average production, 5 ft.

In 1891, erected new stacks of benches of sixes, with half depth furnace; arches, 8 ft. by 9 ft.; retorts, 9 ft. by 14 ins. by 26 ins.; send-out, 18,300,000; average production, 5 ft.

In 1896, send-out was 22,000,000, and average yield 5 ft. Two men on a shift for eight months, and three men on a shift for four months.

Now, what do we find has been the progress in these 43 years of gas manufacturing; viz., in 1853, three iron retorts to a bench, burning off 450 pounds of coal in about five hours, with one man on a shift, producing 1,100 feet to a charge. In 1897, six retorts to a bench, charging with 1,800 pounds of coal, and producing 9,000 feet in four hours, with two men to a shift.

We will now leave the retort house and turn our attention to the purifying department. The first purifying was done with dry lime and was continued until 1878.

1870	cost	$518	purifying	5,800,000	cubic feet.
1871	"	688	"	6,900,000	" "
1872	"	639	"	8,200,000	" "
1873	"	625	"	8,800,000	" "
1874	"	462	"	8,700,000	" "
1875	"	283	"	8,400,000	" "

Some time in 1874 we commenced using the late Mr. Theobald Forstall's system of using lime quite moist, and had only two sets of screens giving each 10 to 12 inches of lime. The cost for the two following years was $265 and $250 respectively, which was a great saving over the old method of using 5 screens with 1½ inches of lime on a screen.

In 1878 we commenced using Connelly iron sponge at a cost of $203, which was in use for six years before it was spent. With this sponge we only had to change purifiers once a month in summer and twice a month in the winter, the average cost per year being $34. We have continued the use of iron for purification to the present time with equally good results as to cost.

Discussion.

The President—Gentlemen, it is extremely interesting to have this, the last written paper before us, just as it is, commencing with the very early stages of gas manufacture and carrying it through the different years up to the present day. It has been extremely interesting to me, as no doubt it has to the rest of you, to hear of the first start of this Company, which recital must put us thinking about various things that occurred in our early experiences with the companies with which we have been connected. If any are here who would like to ask any questions of Mr. Coggshall, or talk over any early experiences with him, there is a short time left in which you may do so.

Mr. Sherman—One item in Mr. Coggshall's experience that he did not refer to I would like to have him bring out, because it has in a measure gone from my memory. I think in 1871 or 1872 he had some litigation with some of his neighbors near the works in regard to odors from the purifying house. Well, now it has gone from my memory how that thing came out, but I think it will be of interest to the members if our memories were refreshed in regard to that, because we are likely to have the same complaint come up again. I remember sending up one of my workmen to assist him, to show the effect of gas on those who worked over it; but if he will give us a history of that litigation I think it will be interesting.

Mr. Coggshall—The matter referred to by Mr. Sherman is almost out of my memory. I think he is right about the year, though I will not be positive. The owner of one of the nearest houses sued the Company for $5,000; and my Directors were so fearful that we should get beat on the matter, that they wanted me to offer him $2,500. I did not do it. I thought our case was a pretty good one. I won't go into any long, extended remarks upon it, but as a result we practically beat the man. One barrel of tar had run on to the grounds—he was a poor man—and one of the jury told me afterwards they thought it would be rather hard to make him pay the costs; so they brought in a verdict that we should pay him $24 or $25 in damages, which verdict put the costs on to us.

Mr. Neal—I should like to ask Mr. Coggeshall if he was not a happier man when he was sending out 6,000 feet a day, and making 3½ feet to the pound than he has been the past few years, when he has been sending out a very much larger amount, purifying at a very much less cost and making 5½ to the pound; under the circumstances with which he is surrounded at this time, did he not enjoy life much more then than he does now? (Laughter and applause.)

Mr. Coggshall—Our Company was a pretty poor one, and I had to do all the work. (Laughter). The way we did in those days, when the pressure would blow the water into the dry well, and we were called upon—that is, I would be called upon—to go and draw it off. We didn't have the air pumps we have now to put pressure on, and I had to do it with my mouth. So that I don't think—although I was always a happy man, no matter under what circumstances I was placed—I enjoyed it full as much as I do now. I think that with the casting of the burdens over on to Mr. Page there for one party, and the electric light on to Mr. Kimball for another, I get along pretty easily.

The President—Mr. Coggshall, as I have remembered him, has been an exceedingly happy man; and, of late years, when he couldn't get all the fun he wanted out of the gas business, he has had his electric light business to turn to. (Applause.) Would anybody like to talk further with Mr. Coggshall about his gas experiences in the earlier or later days?

Mr. Addicks—I move, Mr. President, a vote of thanks to Mr. Coggshall. As one of the younger members of the fraternity, I am struck with the fact that in those days the engineers who say they knew

nothing about it came within 5 per cent. of the cost of their works. I think we all will agree that is very good work. And it would seem that the principle of paying your debts before you do business is the foundation of a very successful business. It would also seem, judging from the details we have had of the business, from 1853 I think it was, to the present time, that a careful account was kept of every portion of the works, and that from the very start the gas people have been very careful in that direction. I have been particularly interested in listening to this paper. I have heard very few papers before the Association that have been more interesting to me personally, as giving an insight into affairs which the younger members know nothing of and can only get an occasional hint of. I move a vote of thanks to Mr. Coggshall.

The President—I think it is a delightful circumstance in this particular case that from the very inception of the Company up to this present day the same man has been in it and in charge of it, and has had a very large financial interest in it. The whole thing is exceedingly unique. Gentlemen, you hear the motion of Mr. Addicks, and it is seconded, that a vote of thanks be extended to Mr. Coggshall for his interesting paper.

(The vote of thanks was unanimously passed.)

Votes of Thanks.

The President—Is there any other business, Mr. Secretary, to come before the Association? Has any gentleman any business that he wishes to bring before the meeting?

Mr. Nettleton—I would like to move a vote of thanks to the President for the impartial way in which he has presided over the sessions that we have just held, and for all he has done to make this meeting a success.

(The motion was put by the Secretary and unanimously carried.)

The President—Gentlemen, I thank you for your kind vote. I thank you also for your close attention at the sessions of yesterday and today. I think you are also to be congratulated upon the large attendance and the large number who have stayed in the room, and also on the successful and interesting papers that have been read. I hope every man has derived more or less benefit, as I believe he has, and that he will go home thoroughly satisfied.

Mr. Sherman—I move that the thanks of the Association be given to our Secretary for the very able manner in which he has performed his duties. Only those who have held the office appreciate the great amount of labor—ill paid labor too, in our case—which devolves on the Secretary; and the success of the meeting largely depends on his labors.

The President—I take pleasure in seconding this motion, for I know very well what a large amount of labor is involved.

Mr. Neal—I was there for 14 years and know all about it, and was about to second the motion, but you have anticipated me.

The vote of thanks to the Secretary was then put and unanimously carried; and the President declared the meeting adjourned.

[Prepared for the Journal.]

A Technical Analysis of Hydrocarbons, Vapors and Gases in Literature and Laboratory.—No. I.

By Dr. W. H. Birchmore.

The technical examination of the various hydrocarbons, gases and vapors used for illumination has been far advanced in various ways, and by as various hands, but the widest differences seem to exist in the opinions of writers, and something very like stagnation in the stream of knowledge to hinder progress, if any endeavor is made to collect the published work and collate the various statements. It, therefore, has seemed to me not useless to re-examine the ground to ascertain, as far as I may be able, if these differences are due to methods, and the stagnation of the stream unexplainable as well as unexplained.

Before entering upon the strictly personal part of the work hereinafter made use of, I wish to make clear the state of the art as our text books show it; in other words, I wish, in a little way, to discuss the statements of some of the various printed matter and the results by the given processes attainable. It is my intention to deal with the material at hand in an order as nearly chronological as possible; but it can not be expected that the treatment will be rigidly historical, for such a study would be tedious and unremunerative. I believe that I have used enough of the enormous mass of printed matter to serve my purpose, but I have by no means exhausted either literature or my notes.

As representing the state of the art in 1875, I have taken the last edition of Watt's "Dictionary of Chemistry," which may be held to represent the orthodox procedure at this date; the edition bears date of 1879. It is plain that in the writing of the contributed article the author, whoever he may have been, used only the descriptions of apparatus and procedure already sanctified by time. The newest apparatus even of that day is not given, the Ettling-Doyere pipettes, which were being then developed to usefulness, are not even alluded to. The work is the work of Bunsen, with just enough of other work to be at the same time "modern, but safe."

Those who have a copy of Sutton's "Volumetric Analysis," the edition of 1882, have at hand all the information which the Watt's "Dictionary" contains, and rather more. Bunsen's work and apparatus, which were even then out of date, are the foundations of both—the very cuts are identical—while Sutton brings his work to an end somewhat later in point of time; in fact, his latest reference is May, 1879. This makes his book of all the more importance in the development of the art. It is the notions of possibilities and probabilities as seen by one of the very best analysts of the age; and, beside, the book contains materials of the utmost value on explosions—analysis, which may well be read by those who are infatuated with "ultimate" as opposed to "proximate" assay. His very way of stating the case shows that even at this time the need of some efficient method of qualitative analysis, the analysis of "what have I," as distinguished from "how much have I?" was felt; and seemingly the same need is present now Some efficient means of "sorting out the ingredients," before we attempt to determine the amounts must be discovered, or we will soon find ourselves in Cimmerian darkness, or in yet worse.

At this time the notion of persuading Mohammed to go to the mountain was beginning to take effect. It was not yet possible to abandon the proceeding of taking the reagent to the gas; but the possibility of using a somewhat more rapid way, either by the use of larger surfaces of absorption or by the use of solutions, was being imagined. This is the era of "laboratory tubes," papier mache, and other balls impregnated with reagents and the like. The apparatus invented under the stress of these ideas has survived, and is still sold, and curiously shows the conservatism of all skilled arts. To this era belongs the apparatus of Elliot, Macintosh, Willard, Failyer, Troilius, and half a hundred men of lesser note. The one central idea is the same. The reagents are placed, if solid, poured, if liquid, into a tube in which the reaction takes place by passing the gas into contact with the reagent; the tube is then washed out, and a new reagent passed in, the gas being elsewhere stored meanwhile. There were, however, evidences in the journals and transactions of the societies that this method was rapidly becoming tiresome, and the idea that afterwards was destined to bear such abundant fruit, the measuring of the varying tension of a fixed volume of gas, vice a varying volume of a fixed tension, was already promising much. At about this same period the importance of benzene in illuminating gas impressed those specially interested. Berthelot had ascertained and asserted its importance as early as 1876. (Abstracts, the *Jour. Chem. Soc.*, 1876, II., 183; and 1877, II., 447.)

In the first supplement to Watts, 1879, p. 629, a new class of facts begins to appear as part of the official record, modestly set forth, apparently because of the great name that fathered them rather than from any conception of the importance of the facts themselves. The notice gives no place or time of publication, but simply says:

"Berthelot has made the following observations on the absorption of gases by solutions of metallic salts:

"(1.) Ammoniacal cuprous chloride directly absorbs oxygen, carbon monoxide, acetylene, ethylene, allylene, propylene (slightly); it does not act immediately on nitrogen dioxide.

"(2.) A solution of ferrous sulphate in sal ammoniac and ammonia rapidly absorbs, as is well known, oxygen and nitrogen dioxide, but it does not act upon acetylene, allylene, ethylene, propylene or carbon monoxide.

"(3.) A solution of chromous sulphate in sal ammoniac and ammonia absorbs oxygen, nitrogen dioxide, acetylene and allylene; but does not act upon carbon monoxide, ethylene or propylene."

Here was the record of the beginning of the differential absorption, but it has not yet reached the stage when it can properly be said to be fully developed. Indeed, in view of some of the statements of recent date this work has been neglected. Tabulated, this note may be thus expressed:

Absorbed by	Am. Cup. Chl.	Ferrous Sul.	Chrom. Sul.
Oxygen.....	Yes.	Yes.	Yes.
Car. Monoxide.	Yes.	No.	No.
Acetylene.....	Yes.[1]	No.	Yes.
Ethylene	Yes.	No.	No.
Allylene.....	Yes.	No.	Yes.
Propylene	But little.	No.	No.
Nitrog. dioxide.	After a time.	Yes.	Yes.

1. This is a mistake; copper acetylide is precipitated.

It seems quite odd that this direction of inquiry has not been further followed, but the fact remains that the technical literature is signally free from any evidence of the pursuit of the clue.

In the same volume of Watts, the discussion of the occlusion of hydrogen by palladium appears, and a note on the presumed Pd:H2 is given, p. 636, with reference to Proc. Royal Soc., XVI., 422; and XVII., 212, 500; also, *Chem. Soc. Jour.* (2) VII., 419. The omission is more instructive than the statement. Hempel had already published (*Ber. Deut. Chem. Gess.*, 1879, p. 1,006) his researches in relation to the occlusion phenomena, and had also utilized the possibility of fractional combustion of hydrogen. In the Dictionary, however, the phenomenon and its utility are alike unmentioned.

In the second supplement to Watt's, p. 504, 1883, C. Winkler appears, not in a reference to the publication of his work in its proper form, but as a reference to an abstract, *Jour. Proc. Chem.* (2) VI., 301; and the analytical scheme is given as follows: "Water vapor is absorbed by strong sulphuric acid, carbon dioxide by caustic potash, and so on. A mixture of oxygen, carbon dioxide, sulphur dioxide, and nitrogen is analysed by absorbing the first three gases with pyrogallic acid in caustic potash; in another trial the *oxygen* (should be sulphur dioxide not oxygen) and carbon dioxide are absorbed by caustic potash alone; and in a third, the sulphur dioxide only is removed by a solution of iodine in potassium iodide. Carbon monoxide is absorbed by a solution of cuprous chloride in hydrochloric acid; if the gas contains at the same time carbon dioxide and oxygen, these are removed by bubbling it through tubes containing a solution of pyrogallic acid in caustic potash previous to its entering the apparatus."

This procedure is very interesting, especially when taken in connection with the apparatus employed. The chemist still carries the mountain to Mohammed, but it is very evident now that the difficulty is in the machine. A method is devised, but not the apparatus for using it. The third supplement to Watt's contains nothing germane to the matter in hand.

From the time of the perfectionating of the Winkler methods, until about the end of 1888, another period of silent development set in. It is really unfortunate that such a routine method of work had settled on the laboratories; but from a rather extended search I am inclined to think that, beyond the regular daily analyses to control the working of furnaces and gas works, there was very little of any consequence done. Routine examinations became the order of the day. At the same time some very pertinent methods were under discussion for special purposes. The question of the constitution of the atmosphere was being investigated, and the methods for analysis of sundry commercial products as well, but the hydrocarbons were practically forgotten. The gas that received the most attention in the gas works seems to have been hydrogen sulphide, and the number of processes suggested are out of all proportion to the amount of gain. In the *Chem. News*, Nov. 23, 1888, is this reference of importance, "Action of hydrogen sulphide upon arsenic acid. (*Zeit. Anal. Chem.*, XXVII., 5.) Le R. W. McKay finds that by passing SH_2 into a solution of alkaline arseniate, acidulated with H_2SO_4, or HCl, a conversion takes place. The arsenious acid thus formed is immediately attacked by the sulphur, and thrown down as arsenic tri-sulphide." This reaction, which is of a kind strictly comparable to that between copper and acetylene, can be utilized in exactly the same way; either by measuring the amount of the gas lost (absorbed) by the reaction, or by the more strictly orthodox process of weighing the resulting arsenic tri-sulphide.

In 1889 occurred one of those tempests in an evaporating dish which always amuse the outsider. In the issue of Jan. 18, 1889, the *Chem. News* quoted from the *Bul. Soc. Chem.*, Dec. 20, 1888: "The presence of benzene vapor in lighting gas and its determination; M. Berthelot. In 1876 the author found that the gas of Paris owes much of its illuminating power to the vapor of benzene. He estimated its proportion by *weighing* the crude nitro-benzene obtained by passing the gas through fuming nitric acid."

By some chance this important word *weighing*, which I have put in italics, was not seen on the other side of the channel, and immediately after the following appeared—as usually happens the criticisms offered had nothing whatever to do with the case; but the standing of the critics makes their "previousness" at least amusing. "Source of error in the estimation of benzene in coal gas. (*Abstracts Chem. Soc.*, 1889, p. 190.) In Berthelot's method for the analysis of coal gas, fuming nitric acid is used to absorb the benzene,[1] and bromine water to absorb the hydrocarbons, CnH_2h and CnH_2n-2. It is shown by the authors, F. P. Treadwell and H. N. Stokes, that fuming nitric acid absorbs carbonic oxide completely. (Compare *Hasenbach, Jour. Proc. Chem.* (2) 50, I.), and that bromine water absorbs benzene as well as the hydrocarbons mentioned. (Comp. *Drehschmidt Post's Chem. Tech. Anal.*, 1888, 108.")

I honestly doubt if in the whole of the literature of the profession of chemistry any other thing as good as this can be found; unless, perhaps, in the acetylene literature. It was bad enough to misunderstand the French, but it was worse to so utterly misapprehend the analytic procedure. Berthelot had already alluded to the facts mentioned, *and described a way in which they could be provisionally utilized.*

In this same year (1889) appeared a book, whose day of usefulness is over, but whose record is of importance—Troilius's "Notes on Iron." Superseded by more modern books, it shows the state of the art at the time of its publication. The apparatus described is interesting, as in a way it foreshadows the "Grisoumeter" and some of Hempel's apparatus. In general the apparatus is the one described so often with the "laboratory tube," but in place of an explosion he uses a small platinum tube to burn the methane that may happen to be present. One of the modern procedures is to burn the methane by means of a wire heated white hot by a current of electricity, while the gas is held in a suitable receptacle surrounding it; Troilius leads the gas through a heated tube. The first important statement in these notes is on page 76: "A saturated solution of common salt (NaCl) should be used to fill the two bottles. Such a solution does not absorb any gas." If this fact can be safely relied upon at all times the method would be an improvement on the Hempel proceeding of saturating water with the mixed gases under examination, for such water gives off the gases again with its vapor, and in my experience has produced data that were as puzzling as they were inaccurate. More will be said on this subject later.

He continues, p. 77: "The gases to be determined are CO_2, O, C_2H_4, CO, H, and CH_4. The nitrogen is taken by difference. Besides these gases the gas mixture (generator gas) may contain small quantities of SO_2, H_2S, etc. The mixture may also contain much steam, when coming hot from the furnace."

The steam he proposes to weigh by the calcium chloride absorption; the SO_2 and SH_2 by the use of iodine are measured. That is, the amount of these two required to decolorise a given amount of a standard solution. This, of course, is subject to criticism on a number of counts, but does not concern this examination, as these are neither hydrocarbons. The CO_2 he determines by potassium hydroxide, the oxygen by the pyrogallate method. C_2H_4, ethylene is determined by the use of fuming sulphuric acid, $H_2S_2O_7$, or by bromine. Carbon monoxide is absorbed by "fresh sub-chloride of copper solution," and H and CH_4 are burned by passing them through a heated platinum tube, as previously stated.

[To be Continued.]

The Recollections of a Country Gas Manager.—No. III.[1]

By "An Old One," in the *Gas World*.

A great deal of trouble was caused by the necessity for banking up the furnace during the summer months, and by the erratic habits of the night stoker in the winter. When the concern did not admit of employing a second night man, and the individual engaged for the office had been improving the shining hour, in one way or another, on his own account, during the day, or possibly had spent some hours in the society of friends at a public house, the outlook was not very promising. The chances were that he would fall asleep and let the heats back, which usually meant a short supply for the next night. But to do him justice, this mishap was not so much due to drinking as to his habit of taking any odd job that offered during the day. Sometimes he would work all day and stoke all night, or at least profess to do so, and how he managed to get that degree of rest which physiologists tell us is necessary for the human system was a mystery that might be partly explained by the state of the heats in the morning. The night man did not always disdain to resort to subterfuge in order to lighten his duties. He would put the right number of charges on the slate, but not into the retorts. And I knew one man who hit upon the artful expedient of tampering with the clock, and would push the hand on half an hour or so and unblushingly set out for home at 5:15 A.M., on the plea that the clock pointed to nearly six. In any case, matters were usually so adjusted as to allow of an easy time during the small hours of the night. The system of carbonizing accounts now usually adopted, even in the smallest works, puts a check upon doings of this sort, but at the

1. This almost amounts to Touchstone's "Lie with a circumstance." To accuse a man of a blunder he did not make, and then deny him the credit of seeing the mistake he might have made—but didn't.—W. H. B.

1. For No. I., see Journal, *ante*, p. 89; No. II., *ante*, p. 166.

time of which I am writing carbonizing accounts, as they are now understood, were rarely kept in a small works. Sometimes no record at all of the daily working operations was preserved, and in other cases a few details were entered on a slate, and copied off once a week by the manager. So long as the holders were full and the gas pure no questions were asked.

Pouching Stokers.—If there were game preserves in the vicinity, it might happen that the night man saw no harm in a few poaching exploits, and the gas works became a convenient rendezvous for one or two others that were similarly inclined. He would plead that the nights were long and dreary, and that it was a comfort to have some one to pass an hour or two with him. But persons of a cynical turn of mind were apt to question whether those who obligingly sacrificed some hours of their rest to cheer his lonely lot were actuated by pure good nature. On one occasion the writer was called up at 4 A.M. by the police, and found that the night man and his associates had been disturbed in the act of enjoying a late supper of roast pheasant. Acting on the advice of the immortal Mrs. Glasse, the game had first been "caught" by some of the party, and then prepared—it would scarcely be correct to say, for the table, as that article of furniture had been dispensed with—by some means known to the initiated, but which I was told consisted simply of throwing the bird on a bed of red hot fuel. If done properly, by the time the feathers were all burned off the game was cooked to a turn. However that may be, the police insisted on marching the whole of the party, including my stoker, away to the lock-up. After rummaging all about, poking into coal heaps, coke heaps, and purifying material, in search of concealed game, they left me, a desolate monarch of all I surveyed, with no heats to speak of, the last two charges neglected, and the holder nearly empty. There was nothing for it but to buckle to, make up the fires, get some coal into the retorts, and put things into shape for the day man.

The fencing round the works was not of the unclimbable description, and if tramps or loafers came in on winter's night, and expressed their intention of staying by the furnace, it was difficult to find an argument that could be successfully applied to induce them to leave. Nor did the solitary policeman object to the comfortable warmth of the retort house, and sometimes, with the abettance of the night man, he snoozed away a good part of the time that should have been spent in tramping the country roads. Sometimes a small group of residents in the neighborhood would get in the habit of dropping in for a smoke and a chat, and I have even known a select harmonic meeting to be held every Saturday night.

A Necessary Glass.—The gasfitter of the past is as much an extinct character as the stoker, for his modern representative has retained none of his habits or tricks of trade. He shared the easy-going disposition that has been remarked upon as a characteristic of the stoker, and thought nothing of telling a customer, at about 4 o'clock on a winter's afternoon, that the gas supply must be dispensed with till to-morrow. Complaints of escapes or deficient supply were left for weeks without being attended to, with the exception of one or two favorites, who, for some reason that did not appear on the surface, always received prompt attention. He was not a teetotaller, and usually looked for a glass of spirits as a corrective to the bad effects of the smell of the gas, and his opinion of the characters of the various consumers was largely affected by the extent to which they fell in with his expectations in this respect. His sphere of duty was very narrow as compared with the present practice, being confined chiefly to laying services, fixing meters, brackets, slide penants, and two-light water slides. The only variation on this was the occasional putting in of a gas cooking stove or boiling ring. His technical knowledge was confined to an acquaintance with the sizes of pipes and fittings used, the main branches being proportioned roughly to the size of the outlet of the meter. A No. 5 fishtail or a 6-feet or 7-feet batswing constituted all that was necessary, in his opinion, in the way of burners, and he did not put in any of the other sizes unless asked to do so. A knowledge of the laws of combustion and of the flow of gas in pipes under various pressures, etc., had scarcely entered into the calculations of the more advanced gas engineers, so we need not wonder that the fitter's ideas on these points were extremely crude.

Before there were Railways.—Another cause that has greatly assisted in the development of gas works in country places is the extension of the railway system. It would now be difficult to find a town of 5,000 inhabitants without its local railway station, or where the coal is not delivered by rail to within about a mile of the retort house. But 30 years ago it was a very common thing to fetch the coal by means of wagons from the nearest seaport or canal, perhaps a distance of 20 miles. So long as this was the case the price of gas was necessarily high, and the supply less certain, as bad weather would stop the coal supply. At best, the cost of the coal on the works was high; and the same may be said in regard to pipes, ironwork, and all necessaries that had to be brought from a distance. Gas consumers in small towns owe more than they are aware of to railway enterprise, in the way of securing a regular supply of gas at a moderately low price.

And now it is time that these "recollections" should draw to a close. In connection with such a line of thought it is the usual thing to indulge in a few sentiments of the "good old times" kind. But it is not possible to do this in connection with our present subject. I do not think anyone will sigh for the early days of gas lighting, unless it be the shareholders, who certainly were free to make larger profits than they are at present. It is one thing, however, to be at liberty to divide 20 per cent. and another to be able to do it. Some undertakings that were favorably situated as to supply of coal managed to do pretty well, but the majority barely paid their way, and I question whether the average rate of dividend throughout the country was larger than it is at present. With the advance in education and in chemical and engineering knowledge, the gas manager of to-day meets with nothing like the ignorance, prejudice, and such like difficulties that beset his predecessor of the last generation.

Schmidt's Electric Gas Lighting Device.

On November 10th, 1896, U. S. Letters Patent (No. 571,288) were granted to Mr. Ernest Schmidt, of Berlin, Germany, for an improved device for lighting gas lamps. Using the words of the specification:

This invention relates to devices for lighting gas and other lamps automatically by means of electricity; and it consists of the details of construction hereinafter set forth. In the accompanying drawings similar letters of reference denote similar parts throughout the several views.

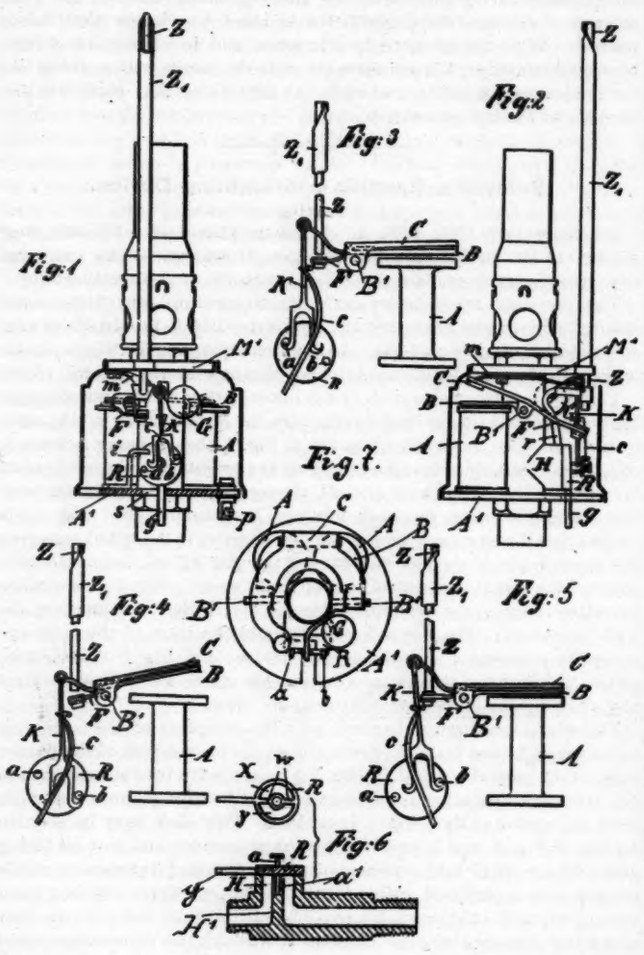
Figure 1 is a front elevation of the lower part of an incandescent gas burner, showing the igniting device with the cap or casing of the same in section. Fig. 2 is a side elevation of Fig. 1, the cap being in section. Fig. 3 is a detail, side elevation, showing the operation of the mechanism for turning the gas cock on and off, the mechanism being in the position it occupies when the cock has just been turned on. Fig. 4 is a similar detail elevation showing the double pawl in the act of engaging the opposite pin of the gas cock to turn the gas off on the next movement of the armature controlling the said pawl. Fig. 5 is a similar elevation showing the armature attracted by the electromagnet and the cock turned off. Fig. 6 is a detail, sectional elevation of the cock employed in connection with the present device; and Fig. 7, a horizontal section through the burner tube, taken just above the armature pivot and showing the double armature in plan view.

The whole igniting mechanism, with the exception of the battery, is mounted on a base plate A', arranged at the lower part of the burner tube, and a partially rotating disk R is employed to turn the gas on and off, although any other suitable cock might be used without departing from the nature of the present invention. This disk may be seen in section at Fig. 6, and is provided with depressions x and y on its facing and with a central bridgepiece w, dividing the said depressions, while the gas tube is provided with a lateral facing, on which the disk turns on a pivot, said tube having a partition H', so that the gas can only pass to the burner along the channel H through the depressions x and y, and when the disk is turned so that the bridge w corresponds with the partition end the gas supply will be cut off. The disk R is pivoted at a' to the partition and provided with two substantially diametrically oppositely arranged pins a and b, over which the double pawl K, which is actuated by the electromagnet A, can engage alternately, and exercising a pull on same opens or closes the cock. The cock is provided with a downwardly extending tail g, which passes through a slot in the base-plate A', the ends of said slot forming stops for the movement of the disk R, as will be seen from Fig. 1.

Attached to the center of the disk R is a spring c, which engages the arm of the double pawl K in the following manner: The double pawl K is loosely suspended from the projecting arm of a double armature, hereinafter to be described. When the armature is attracted, the pawl is raised, and when the same is released the pawl sinks to its lowest position. The object of the spring c is to throw the pawl K or its corresponding hook under the hooks or pins a and b of the disk R alternately. Thus, for instance, supposing the two pins a and b to be in the horizontal plane opposite each other, and the cock neither closed nor fully open, then the spring c will exercise no pressure on the rod of the pawl. If now the cock is fully opened by the action of the armature, as shown at Fig. 3, then the spring will have been turned by the move-

ment of the disk *R*, to which it is attached, and will exercise pressure on the pawl rod, tending to push it to the right of Fig. 3. As soon now as the armature has been released the pawl will fall and the action of the spring *c* will throw it under the pin *b*, as shown at Fig. 4. On the next movement of the armature the pawl will pull the disk round in the opposite direction by means of the pin *b* and close the cock, simultaneously turning the spring in the opposite direction, so that on the next release of the armature the pawl on falling will be thrown under the pin *a* ready to turn the cock in the opposite direction at the next movement of the armature.

The electromagnet *A* is mounted on the base plate *A'*, and a double armature *B C* is pivotally supported on pivots *B' B'*, fixed in the sides of the burner tube. The arrangement of the armatures *B C* will be best seen from Figs. 1, 2, and 7. Both armatures are arranged to turn



on the same pivots, as clearly shown at Fig. 7, and the lower armature *B* is provided with a counterpoise *G*, which pulls it away from the magnet when the latter is not excited. The upper armature *C* passes through a recess in the lower one *B* at a point above the electromagnet and is capable of vibration on its pivots without influencing the armature *B*, for a reason hereinafter stated. The lower armature *B* is extended round behind the burner tube, looking from the magnet side of the same, and carries at this side the double pawl *K*, which is loosely suspended therefrom, so that a movement of the lower armature *B* will operate the pawl *K*. The upper part *C* of the armature when attracted will close a spark generating electric circuit by means of tubular rods *Z* and *Z'*. The outer rod *Z'* is fast on a plate *M'* on the burner tube, and the inner tube *Z* is insulated and vertically guided to slide within the tube *Z'*, the upper ends of the said tubes being formed to produce electric sparks when the armature is attracted. The inner tube *Z* is normally held down, with its upper bent round end, Fig. 2, resting on the upper end of the tube *Z'*, by means of an insulated spring *m*, mounted on the under side of the plate *M'* and acting on the lower end of the tube *Z* to keep the same down on the tube *Z'*. The lower end of the inner tube *Z* is connected by a small tube *r* to the gas cock, and its upper end is formed to produce a jet flame, when the cock is opened, which will be ignited by the electric sparks generated at this point.

One pole of the battery is connected to the contact screw *P* on the plate *A'*, which is insulated from the gas tube of the burner, and the other pole is connected to the burner tube.

The end *F* of the upper armature *C* is formed to engage under the end of the rod *Z* when this armature is attracted, and push the same slightly upward, so that electric sparks will be formed at the upper end of the tubes Z Z'.

When the current is sent through the apparatus, both the armatures will be attracted, one, *B*, opening the gas cock in the manner already described, and the other, *C*, slightly raising the jet flame tube Z against the pressure of its spring *m*, so that gas will be fed to this tube through *r*, and at the same time sparks will be generated at the upper ends of Z and Z' and the jet flame lighted. On turning off the current the armature will be released and the pawl will fall down ready to engage the opposite pin of the disk *R* at the next attraction of the armature and operate the cock in the opposite direction.

The object of making the armature in two parts *B* and *C* is that when sparks are produced at the upper end of *Z Z'* by the contact of the end *F* of the lever *C* with the lower end of *Z* the latter is liable to vibrate, and were the armature in one piece this vibration would be liable to be communicated to the cock and cause the same to be turned partially back, possibly before the gas may have been lighted. In the present case the part *C* of the armature is free to vibrate and cannot communicate its vibration to the part *B*, which remains in position on the electromagnet as long as the same is excited.

Instead of arranging a jet flame it is obvious that the electric sparks may be employed to ignite the gas direct without first igniting the jet, but the latter is preferable in connection with incandescent gas lamps.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following official notice, from Mr. John Clements, in whose charge has been placed the "Experience Department" of the Pacific Coast Gas Association, explains itself:

PACIFIC COAST GAS ASSOCIATION,
EXPERIENCE DEPARTMENT,
RED BLUFF, CAL., March 8, 1897.

Mr.——, Dear Sir: At the last meeting of our Association, in July, 1896, I was chosen to take charge of the above-named Department, for the purpose of obtaining from the members of the Association such matter as they might choose to contribute on various subjects connected with the manufacture of gas and the management of their several plants; and now, in compliance with the wishes of the Association, I address myself to you, and ask that you contribute something from your store of knowledge, to the end that I may present them, together with others, in a compiled form. There are many things you may think of that would be of interest to the members. You will allow me to suggest a few:

"Give me your experience with various kinds of coal, both for fuel and gas making."

"Have you used Wallsend coal?"

"Have you used Hetton coal?"

"Have you used Pacific Coast coals?"

"Have you used Japan coals?"

"What has been your experience with any or all of them?"

"Have you used regenerative benches?"

"Have you used open settings?"

"If you run a small gas works, have you used clay or iron retorts, or both; and what is the result of your experience with either or both?"

"Have you made water gas on a small scale?"

"Have you made water gas on a large scale?"

"What is your experience with the apparatus you have employed? If you have used more than one kind, which do you consider the best and most economical?"

"Have you used fiber pipe; and what is your experience with it?"

"Do you use Welsbach burners? Would like a full statement on this subject, as to the furnishing of lamps and renewals to customers."

"Have you handled gas stoves; if so, how do you manage that branch of your business?"

"Have you tried more than one method in this line; and what is the result?"

"Have you tried prepayment meters; and what is your experience in this line?"

There are many other things that no doubt have come under your observation that would be of interest to the members. While they may seem commonplace, that, however, should not deter you from giving the Association the benefit of your experience. Hoping that I may hear from you at once with something for the common good of the Pacific Coast Gas Association, I am, Sir, yours truly and fraternally—JOHN CLEMENTS.

IT is quite within the bounds of likelihood that the Brooklyn Union Gas Company, of Brooklyn, N. Y., will institute suits against the local railroads operated by electric currents, to determine whether or not the latter are responsible, in a pecuniary sense, for the damage that such method of operation causes through electrolysis to the Gas Company's mains.

WRITE to the Detroit Stove Works for a copy of its new catalogue for 1897. It is a beauty.

MR. ISAAC S. CASSIN, at one time in charge of the Philadelphia Municipal Gas Works, died in Philadelphia about a fortnight ago. At the time of his death, and since 1879, he was a member of the Philadelphia Public Buildings Commission.

THE following details and query are from Mr. F. W. Stone, Manager of the Ashtabula (Ohio) Gas Company, who writes from that city under date of the 13th inst. We submit the same to our readers, in the belief that one or more of them may be able to help Mr. Stone out of his dilemma:

To the Editors AMERICAN GAS LIGHT JOURNAL: I have a customer here to whom I could sell a great deal more day-consumption gas, provided I could heat a furnace with it. The requirements are that we bring a furnace 24 inches long, 4 inches wide, and of any necessary depth, to a sufficient temperature to heat small pieces of iron, 1¼ inches by ⅝th inch by 6 inches, so that they may be forged under a drop hammer; but one end of the iron is forged at a time. The furnace may be closed at back, ends and top, an opening being left in front the entire length of the furnace and of sufficient height to admit of the insertion of the irons into the fire. I have constructed several experimental furnaces; but, even with an air blast, do not seem to be able to attain the desired degree of heat, no matter how much gas can be consumed. I can get flame enough, but not heat enough. An excess of air causes the gas to fire back. It has gotten to be a question of not "How much gas?" but, "Can I do it at all?" There are circumstances which would make my customer give a good deal to be able to fire by gas. I do not like to trouble you, but am almost at the end of my resources, and do not know where else to go for the information. Can you direct me? A reply of some kind would greatly oblige.

MR. DANIEL H. KEIM, formerly Treasurer of the Pottstown (Pa.) Gas Company, died at his home in that city the evening of the 6th inst. He had been prominent in the business affairs of Pottstown since 1870.

AT a recent meeting of the Directors of the Hamilton (Ont.) Gas Light Company it was decided "to adopt the semi regenerative system in carbonization." This means that the Company's superintendent, Mr. Edmund Cathels, has been authorized to erect a stack of 6 benches, each bench to contain 6 rounded D-shaped retorts. The construction will include new iron work; in fact, everything necessary to make the settings in keeping with prevailing practice in the direction indicated.

WE are indebted to a correspondent for the following "Object Lesson in Municipal Ownership," which lesson comes from the operation, at Alameda, Cal., of a municipal electric lighting plant:

"The present city officials of the city of Alameda acknowledge the cost of each electric street lamp, per annum, to be $90; hours of lighting 1,300; cost per hour per lamp 6.8 cents.

"The city of Oakland (Cal.) under existing contract, pays for each lamp per annum, $151.34; hours of lighting, 3,600; cost per hour per lamp, 4.2 cents.

"Loss by municipal ownership on each lamp per annum, $33.80—assuming $90 to be correct. Loss of taxation on plant should also be added.

"Actual cost to taxpayers in Alameda has been, per lamp per annum, about $135; cost per hour, 10.3 cents; loss per annum, on 100 arc lamps, $7,930."

MR. THEODORE H. COLVIN, of Providence, R. I., has commenced work on his new foundry building, which is to have a length of 180 ft. and a width of 102 feet, and he proposes to have a complete and modern foundry building in every respect. The central portion, 50 feet in width, will be served with a 20 ton traveling crane, and at distances of about 25 in the length of the building will be placed 5-ton jib cranes swinging from the moulding floors in the wings, which extend along both sides of the building, with a width of 25 feet. The entire framework of the building is to be of steel, and the roof covering will be of slate. The steel work is being furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Conn.

THE Lewiston (Me.) Gas Light Company will lay this summer a 16-inch trunk main line, from the works on Lincoln street to Chestnut street.

THE Northwestern Natural Gas Company having discontinued the supply of natural gas in Norwalk, O., the main system was sold to Mr. Parks Foster, of Elyria, O., who proposes to utilize the pipes for distributing manufactured gas for fuel and illuminating purposes to the Norwalkites. With that end in view he has authorized the United Gas Improvement Company to construct for him at Norwalk an entire plant for the manufacture of water gas. The works are to have a daily capacity of 250,000 cubic feet, and the contract calls for apparatus and machinery of approved modern type. The understanding is that the supply of gas will be laid on some time in May.

A PROJECT for the supply of gas to Lonaconing, Md., is underway. This place, which is the capital of Allegheny county, Md., is on the Cumberland and Pennsylvania Railroad, at a point 16 miles west-southwest of Cumberland. The principal industry is coal mining. Population about 5,500.

THE authorities of Phœniz, Arizona, have granted the incorporators of the Phœnix Light and Power Company the right to operate a gas works in that place. Under the franchise the Company agrees to furnish gas at "$4 per 1,000, or less." This place is the capital of Maricopa county, Arizona, and can be reached by rail over a branch of the Southern Pacific Railroad. It is a fairly flourishing center, and has a population of perhaps 4,500.

AT a meeting of the shareholders of the South Amboy (N. J.) Gas Light Company, held recently, the new proprietors assumed control of the property. The election for Directors resulted as follows: John Firth, George E. Woods and Henry W. Richardson, of New York, and Chester Huntington, of Flushing, L. I. At a subsequent meeting of the Directors the following executive management was chosen: President, John Firth; Vice-President and General Manager, George E. Woods; Secretary and Treasurer, George E. Hoppie. President Firth is President of the Interstate Realty Company, of New York, and Vice-President Woods is connected with the engineering department of the Standard Gas Light Company, of New York. It is proposed to make important betterments on the South Amboy works, the same to include a 50,000-ft. holder, a street main governor, a 50-horse power boiler, and 2 miles of mains. It is also estimated that 200 meters and 100 gas ranges will be placed this year.

IT is more than likely that an arrangement will shortly be consummated whereby the Cambridge and Woburn (Mass.) Companies will absorb the business of the Arlington (Mass.) Company, the purchasers dividing the districts of Arlington, Belmont and Winchester between them.

AT the annual meeting of the shareholders of the Red Bluff (Cal.) Electric Light and Gas Company the following Directors were elected: E. W. Runyon, D. S. Cone, W. B Cahone, John Clements and N. P. Chipman. The Directors afterwards named the following executive management: President, E. W. Runyon; Vice-President, D. S. Cone; Secretary, John Clements; Treasurer, Bank of Tehama county.

MR. J. A. FAUX, formerly of Pittsburgh, Pa., is at St. John, N. B., engaged in reconstructing the gas works at St. John, which is now under the control of the St. John Railway Company, which concern also operates the local electric lighting plant. Mr. Faux is well and happy.

THE United Gas Improvement Company is installing a standard set of double superheater Lowe water gas apparatus, of a daily capacity of 350,000 cubic feet, in one of the stations of the Elizabethtown Gas Light Company, of Elizabeth, N.J. This plant will be operated in connection with the Elizabethtown Company's coal gas plant.

Mr. JOHN BAILEY, formerly prominent in the affairs of the Washington (D. C.) Gas Light Company, died in Washington on the 11th inst. He was born (1813) in Portland, Maine, but had made his home in Washington since 1847. For many years he held the position of Disbursing Clerk to the House of Representatives.

SOME days ago, Superintendent Strong, of the Asbury Park station of the Consolidated Gas Company, of New Jersey, appeared by invitation before the Citizens Mutual Organization, of Ocean Grove, to submit reasons why the Company should be allowed to pipe the streets and "ways" of the famous camp meeting ground. It is not at all unlikely that the necessary consent will be granted before the summer season is on.

ACCORDING to the tests made by the official inspector (Mr. A. Aubin) of the quality of the gas supplied by the Montreal Gas Company during the month of February, the candle power shows an average of about 17.90. There was shown quite a variation, as betwen the tests, the minimum candle power having been 17.01, and the maximum 19.22. Under the statute applicable the candle power shall not be less than 16.80.

A CORRESPONDENT forwards the following: "Elmer E. Prescott was sentenced to pay a fine of $100 for tampering with the gas pipe connections in his bath house at 101 Desplaines street, Chicago, by Judge Goggin, on the 12th inst. The case of Prescott is the first of the kind that ever came to trial in the Criminal Court. It was found that a false wall had been constructed in the basement of Prescott's bath house, and behind this wall was a tank, into which gas from the mains could be turned. When there was danger of discovery gasoline was poured into the tank, and the connection with the gas mains cut off until all danger of detection was over, when the connection was renewed. The testimony before Judge Goggin was to the effect that hundreds of dollars' worth of gas had been used without any record thereof on the meter. Under another complaint, filed in Justice Foster's Court the same afternoon, John Travis, who owns property and lives at 1928 State street, is guilty of having stolen $875 worth of gas. Late in the day, a warrant having been served upon him, Travis was taken before Justice Foster, where he gave bonds to appear for trial, March 22d. The Chicago Gas Light and Coke Company alleges that Travis never took the trouble to ask the Company for permission to help himself to its gas, and, without consulting anybody, connected a pipe with a pipe of the Company, with the ultimate result stated above."

MR. J. LUTHER has been elected Treasurer of the Chicopee (Mass.) Gas Light Company, vice Mr. C. H. Nutting, resigned.

AT the annual meeting of the Providence (R. I.) Gas Company (the 50th in its history) a large majority of the stock was voted. The annual reports showed that the sendout for 1896 exceeded that for 1895 by 2,643,000 cubic feet. The total number of meters in use, Jan. 1, 1897, was 21,348; during the year 752 services were put into buildings; there are 9,777 gas stoves in use; and 10½ miles of mains were laid during the year, bringing the total mileage to 234. The following officers were chosen: Directors, William Goddard, A. B. Slater, Royal C. Taft, Edward Pearce, Jesse Metcalf, Geo. W. R. Matteson, Lucian Sharpe, Newton D. Arnold and J. Edward Studley; President, Royal C. Taft; Vice-President, Col. Wm. Goddard; Secretary and Treasurer, A. B. Slater.

[No. VI.]

Some Details of the Displays at the Recent Gas Exhibition, Madison Square Garden, New York, under the Auspices of the Gas Industries Company.

As was to be expected, the manufacturers of gas cooking and heating apparatus were prominent amongst the exhibitors, and their displays quite naturally attracted the close attention of the professional and non-professional visitor. Indeed it was quite a difficult matter, after listening to the questions put to the men in charge of the various gas stove displays, when a crowd had gathered around any particular booth, to determine who was the professional and who the amateur inquirer, so practical were the queries put by all.

The exhibit of Messrs. George M. Clark & Company, of Chicago, covered spaces Nos. 44, 45, 46 and 47, and the floor space thus secured granted the exhibitors ample chance to tastefully dispose their wares for display. The design of the exhibit was well-calculated to permit of the easy and rapid inspection of the goods, and Treasurer Wells proved himself an adept in proclaiming the virtues of the "Jewels" which his Company puts out in goodly numbers. His main reliance as an attraction was the "Jewel Range," 14 handsome samples of which were shown. A great variety of smaller apparatus—such as iron heaters, griddle irons, curlers, etc.—completed the display. It might also be said that neat specimens of heating radiators were on show.

The exhibit of Messrs. William M. Crane & Co., of 838 Broadway, New York, was comprehensive to completeness. Their display in spaces Nos. 171 to 177, flanked that of the Maryland Meter and Manufacturing Company, and it was always besieged by an inquiring throng. This was not to be wondered at, as the following list and short description of what they had on show will prove: A working specimen of the "combination boiler," for the speedy raising of water to the temperature required for dishwashing (this can be accomplished in 30 seconds), or for heating water for a bath (in 30 minutes) let the bathroom be in any part of the house. The boiler can be attached to the house water circulation system at will. Complete hotel outfits, of hotel ranges, with shelves and hood; gas broilers to cook from 50 to 300 steaks per hour; hotel closet or pantry warmers, pastry ovens, carving tables, coffee and tea urns, waffle stoves, griddles of all sizes, oyster cookers, poultry singers, etc. The wares for household use included two full lines of "Vulcan" and "Perfect" ranges and three lines of hot plates. There were also shown tailor and laundry stoves; heaters of varied descriptions, including fireplace heaters, fuel fires, radiators, cylinder stoves, perforated stoves, gas logs, and special laundry and tailors' stoves for manufacturers' use. The "Vulcan" hot air furnace and the "Vulcan" hot water heater had prominent places in the display. Several varieties of ovens were shown. A very unique feature of the display was a tower, 13 ft. 6 ins. in height, finished in brass, composed of different sizes of gas logs, from 12 inches up to 36 inches. Three sizes of "giant" burners, consuming from 50 feet to 200 feet of gas per hour, for manufacturers' use, attracted much attention.

Of the smaller devices in the Company's line were shown specimens of Bray burners, curling iron heaters, nursery burners, gas irons, self-lighting burners, coffee roasters, confectioners' stoves, letters for illuminated gas designs, soldering furnaces, toasters, urn burners and fittings of all kinds. The Messrs. Crane, in space No. 60, gave a separate exhibition of the "Hall Keramic Kiln," for firing decorations on china, etc. In every respect the display of the Messrs. Crane was complete.

The Detroit Stove Works Company, of Detroit and Chicago, occupied spaces Nos. 93 and 99, and its well planned exposition was zealously watched and voluminously and volubly explained by the Messrs. Van Wie—father and son. The Company exhibited a fine line of Detroit "Jewels," as will be understood from a scanning of the following list: A No. 216 gas range, and the same fitted with water heater; also a No. 218 range with water heater and broiler—a very ingenious combination apparatus; a combination coal and gas range; a No. 614 gas range; a No. 616 range, with water heater; and a No. 718 range, with water heater and vertical broiler. Well finished specimens of radiator heaters (4 and 6-tube) were also shown, as were samples of isolated vertical broilers and water heaters.

Messrs. A. Weiskittel & Sons, of Baltimore, Md., and New York, took up spaces Nos. 51 and 52 with their wares, and the display was perfected and watched over by the Messrs. Anton and Henry Weiskittel, of Baltimore, and Mr. Hetzel, of the New York branch. These gentlemen should be quite well satisfied over the success of their efforts as designers, for the goods were shown to the best possible advantage. The main attraction at their booth was the firm's new "Royal" white enameled gas range. The entire interior of the "Royal" is lined with white enamel, and it is fitted with racks arranged so as to swing out of the oven, a plan that insures cleanliness where the cooking is to be done. The enameling is a preventive, of course, of rust, and is a non conductor of heat as well. The exterior of this range is made of cast iron and the space between the enameled plates and the external cast iron is packed with mineral wool to prevent radiation. The top of the range oven is lined with firebrick. Another advance in the construction of this range over ordinary practice is the locating of the top broiling and cooking burner, which is put at the right hand top corner. It consists of a double burner with light cast iron open work centers, which, speedily becoming warm, throw down an intense heat for broiling purpose, the cooking meanwhile going on above the same burner. As Mr. Anton Weiskittel said: "Two birds are thus killed with one stone." The stove carries 3 added top burners (one of extra size, for use where straight fuel gas is sold), any or all of which may be used, according to the speed required for completing the cooking operation. Other specialties shown by the Messrs. Weiskittel were their well-known lines of ordinary "Fire King" ranges, stoves (laundry and otherwise), tailors' iron heaters, soldering iron heaters, round and square gas heaters, gas logs and grates, water heaters, baking plates, upright and flat broilers, and so on.

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MONDAY, MARCH 22, 1897.

Utah Coal.

BY MR. J. M. GOODWIN.

The Pleasant Valley Coal Company has two mines at Winter Quarters, near Scofield, both being on the same vein and separated by a gulch between. The gulch affords space for the railway line, machinery and dump. These mines are thoroughly equipped with machinery and produce a most excellent coal.

At Castle Gate the company has extensive mines and a coking plant where 100 tons of coke are now turned out daily. It has 104 ovens. No mines are any better equipped than are these. The best class of machinery is used, and electricity is brought largely into use in hoisting cars from lower levels and taking empties into the mines. During the past year the mines turned out 316,000 tons of commercial coal, while the coking plant produced 22,000 tons of coke.

There was expended in the way of improvements :

Machinery, etc., at Winter Quarters	$11,000
Machinery, etc., at Castle Gate	21,000
Coke ovens at Castle Gate	8,500
Total improvements	$40,500

The Union Pacific Pleasant Valley coal mine at Scofield has a vein 24 feet thick of most excellent bituminous coal, and it is so well opened and admirably located for cheap mining as to make it one of the best mines in the west. During 1896 it produced 45,995 tons of commercial coal.

Coalville has been much of a coal mining center for 30 years, the first mines opened in Utah having been discovered and worked there. Some of those old mines were worked out years ago, while others have been developed and become large producers through many years. The district covers a large area. The mines opened at Coalville and at Grass Creek are on continuous measures, so it is claimed. New interests attach to this district because of the activity directed in development of mines and proposed improvements to soon follow. The mine producing the largest amount of coal at present is the one operated by the Weber Coal Company. This is the old property which in the past has been known as the Home, the Wasatch, and by some other names, and for the past few years was operated by the coal department of the Ontario Silver Mining Company. It is now designated the Wasatch. This mine, as it now is, has a good steam hoist, with modern conveniences for handling coal. The vein crops out on the hill on the south side of a gulch and dips under it. The power house, dump, etc., are built across this gulch and over the railroad tracks, so as to dump coal into cars under the screens and tipple. A steep, inclined shaft intersects the vein down 300 feet, after which the incline changes its course and follows the vein down 300 feet more. There are six levels running at right angles extending a half mile each side of the shaft. Coal is extracted by cutting out rooms, then running down to the levels and taken to the shaft to be run up. Since the dip of the vein is from 20 to 25 degrees it is easy to run rooms upward from each of the levels. The coal measure is about 10 feet, covered by 40 feet of solid sandstone, while the foot is soft, a condition making it requisite to leave very large pillars of coal when cutting out rooms. This soft ground heaves, and would crush small pillars. After mining out rooms above levels, these pillars, 80 feet wide, are drawn out, so there is practically no loss of coal. But there is loss in all coal mines of certain per cents of slack or waste. Because of the soft character of this coal the loss amounts to about 30 per cent. which is thrown into the waste dump. All this waste has to come out of the mine to prevent spontaneous combustion.

In operating, this mine employs 60 men, and the average output for the one eight-hour shift is about 250 tons. Of course, the capacity of the plant is several times that much per day. Miners are paid 33½ cents per ton without any discount for waste, and they make good wages. Other men are paid 20, 25, 27½, and 30 cents per hour, according to the work. During this winter the mine is operated at least six days per week. Last summer it was operated only about half that length of time. The market for its coal is chiefly Park City, with this city as the second largest consumer. During the year 1896 this mine produced 54,000 tons of coal.

The Market for Gas Securities.

All city gas shares are reported at higher figures than those of last week; perhaps the most noteworthy advance having occurred in the East River brands, the common of which is 52½ bid, with the preferred at 89 to 90. Consolidated opened to-day (Friday) at 159 to 159¼. The positive votes in the Senate by which the Cantor-Laimbeer bill failed of advancement, and the text of the bill affecting gas rates in New York city, which the Committee on Miscellaneous Corporations reported as a substitute for the Cantor-Laimbeer measure, are no doubt the causes that intensified the upward movement. The substitute measure is virtually equal to the terms of the contract offered the authorities of Brooklyn for the supply of gas in that city for the next five years, the text of which is in the JOURNAL for February 8th last. Sections 1 and 2 of the substitute plan are :

Section 1.—A corporation, association, company, co-partnership or person shall not charge or receive for illuminating gas in a city, as now constituted, which has a population of 1,500,000, sums to exceed, per 1,000 cubic feet, during the remainder of the year 1897, $1.20; during the year 1898, $1.15; during the year 1899, $1.10; during the year 1900, $1.05, and during each year thereafter $1.

Sec. 2.—Such a corporation, association, company, copartnership or person shall not charge for illuminating gas for the use of any city sums to exceed per 1,000 cubic feet, during the remainder of the year 1897, $1; during the year 1898, 97½ cents; during the year 1899, 95 cents; during the year 1900, 92½ cents; during each year thereafter, 90 cents.

Other provisions in the bill declare that the illuminating value shall be not less than 22 candles, and that the act shall take effect May 1, 1897. This is the measure that will become a law, in case any change is made.

Brooklyn Union is steady as to the stock, and buoyant as to the bonds. Bay State is down to 10, at which figure it is a purchase. Chicago is booming, on the half understanding that an agreement between it and the Universal Company has been arrived at.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.
35 WALL ST., NEW YORK CITY.
MARCH 22.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	159	159¼
Central	500,000	50	105	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	207	210
Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	225	
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	52¾	53¼
Preferred	2,000,000	100	89	90
Bonds 1st 5's	3,500,000	1,000	107	108
" 1st Con. 5's	1,500,000	..	97¼	98
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	
Standard	5,000,000	100	85¼	87
Preferred	5,000,000	100	..	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	..
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	98¼	99¼
" " Bonds (5's)	15 000,000	1,000	110	111
Bay State	15,000,000	50	10	10¼
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	..	85
2d " " "	3,000,000	1,000	70	72
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	79¼	80
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,000,000	..	68	70
1st Mortgage	1,085,000	..	..	93

Consumers, Jersey City....	2,000,000	100	..	75
" Bonds.....	600,000	1,000	100	102
Cincinnati G. & C. Co.....	8,500,000	100	203½	205
Consumers, Toronto.....	1,600,000	50	184½	187
Capital, Sacramento.....	500,000	50	..	35
Bonds (6's).....	150,000	1,000	..	..
Consolidated, Baltimore....	1,000,000	100	61⅝	61⅝
Mortgage, 6's.....	3,600,000	..	107	107½
Chesapeake, 1st 6's. ..	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's....	1,490,000	..	..	..
Detroit	4,000,000	..	22	..
" Con. Bonds.....	4,312,000	..	72½	74
Equitable Gas & Fuel Co., Chicago, Bonds.....	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	82	84
" Bonds.....	2,000,000	..	91	93
Hartford.....	750,000	25	..	145
Indianapolis.....	2,000,000	..	130	135
" Bonds, 6's.....	2,650,000	..	105	107
Jersey City.....	750,000	20	180	..
Lafayette Gas Co., Ind.....	1,000,000	100	84	88
Bonds.....	1,000,000	1,000	92	94
Louisville.....	2,570,000	50	..	..
Laclede, St. Louis.....	7,500,000	100	24½	25
Preferred.....	2,500,000	100	75	78
Bonds.....	9,034,400	1,000	94½	95
Little Falls, N. Y.....	50,000	100	..	100
Bonds.....	35,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.....	1,000,000	..	98	98
Bonds, 6's	4,000,000	..	123	..
New Haven.....	1,000,000	25	225	..
Oakland, Cal.....	2,000,000	..	53½	54
" Bonds.....	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage....	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City.....	500,000	50	..	175
Paterson, N. J.....	.....	25	99	102
Rochester Gas & Elec. Co..	2,150,000	50	..	..
Preferred.....	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	97¾	98¾
St. Paul Gas Light Co.....	1,500,000	100	67½	70
1st Mortgage, 6's.....	650,000	..	84	87
Extension, 6's.....	600,000	..	..	..
General Mortgage, 5's .	2,400,000	..	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.....	2,000,000	20	250	..
Western, Milwaukee.....	4,000,000	100	59	61
Bonds, 5's.....	3,556,000	..	90	91
Wilmington, Del.....	500,000	50	180	182

Advertisers' Index.

GAS ENGINEERS.

Page

Wm. Henry White, New York City..... 471
Fred. Bredel, Milwaukee, Wis..... 456
Geo. R. Rowland, New York City..... 471
The Western Gas Construction Co., Fort Wayne, Ind.... 462
Humphreys & Glasgow, New York City..... 458
T. G. Lansden, St. Louis, Mo..... 471
American Gas Co., Phila., Pa..... 456
David Leavitt Hough, New York City..... 473

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md..... 469
United Gas Improvement Co., Phila., Pa..... 461
Burdett Loomis, Hartford, Conn..... 470
National Gas and Water Co., Chicago, Ills. 468
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 469
The Western Gas Construction Co., Fort Wayne, Ind.... 462
Humphreys & Glasgow, New York City..... 458

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City..... 472
Continental Iron Works, Brooklyn, N. Y..... 470
Deily & Fowler, Phila., Pa..... 472
Kerr Murray Mfg. Co., Fort Wayne, Ind 468
Stacey Mfg. Co., Cincinnati, Ohio..... 471
Bartlett, Hayward & Co., Baltimore, Md..... 469
Davis and Farnum Mfg. Co., Waltham, Mass..... 468
R. D. Wood & Co., Phila., Pa..... 470
Isbell-Porter Company, New York City..... 470
Fred. Bredel, Milwaukee, Wis..... 456
United Gas Improvement Co., Phila., Pa..... 461
Berlin Iron Bridge Co., East Berlin, Conn..... 458
National Gas and Water Co., Chicago, Ills..... 468
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 469
The Western Gas Construction Co., Fort Wayne, Ind.... 462
Humphreys & Glasgow, New York City..... 458
Gas Engineering Co., Pittsburgh, Pa..... 468
American Gas Co., Phila., Pa..... 456
Logan Iron Works, Brooklyn, N. Y..... 472
Riter & Conley, Pittsburgh, Pa..... 455

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City..... 471
R. D. Wood & Co., Phila., Pa..... 470
James R. Floyd & Sons, New York City 472
Continental Iron Works, Brooklyn, N. Y..... 470
Gas Engineering Co.. Pittsburgh, Pa..... 468
Logan Iron Works, Brooklyn, N. Y..... 472
Riter & Conley, Pittsburgh, Pa..... 455

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 469
Fred. Bredel, Milwaukee, Wis..... 456
J. H. Gautier & Co., Jersey City, N. J..... 466
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 466
Adam Weber New York City 466

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons. New York City..... 470
R. D. Wood & Co., Phila., Pa..... 471

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich..... 453
G. Shepard Page's Sons, New York City 471
Gas Engineering Co.. Pittsburgh, Pa..... 468

GAS METERS.

John J. Griffin & Co., Phila., Pa..... 476
American Meter Co., New York and Philadelphia..... 475
Helme & McIlhenny, Phila., Pa. 475
D. McDonald & Co., Albany, N.Y..... 475
Nathaniel Tufts, Boston, Mass..... 474
Maryland Meter and Mfg. Co., Baltimore, Md.... 474
Metric Metal Co., Erie, Pa 474
Keystone Meter Co., Royersford, Pa..... 474
Buhl Stamping Company, Detroit, Mich..... 475

PREPAYMENT METERS.

American Meter Co.. New York and Philadelphia 475
John J. Griffin & Co., Phila., Pa..... 476
D. McDonald & Co., Albany, N. Y..... 475
Helme & McIlhenny, Phila., Pa..... 475

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio..... 478
M. J. Drummond, New York City..... 478
R. D. Wood & Co., Phila., Pa..... 470
Warren Foundry and Machine Co., New York City..... 478
Donaldson Iron Co., Emaus, Pa..... 478

PIPE CUTTERS.

Wm. Anderson, East Boston, Mass. 455

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City..... 463

GAS COALS.

Penn Gas Coal Co., Phila., Pa..... 465
Perkins & Co., New York City 464
Despard Gas Coal Co., Baltimore, Md..... 465
Westmoreland Coal Co., Phila., Pa..... 465
Berwind-White Coal Mining Co., New York and Phila. . 464

CANNEL COALS.

Perkins & Co., New York City 464

GAS ENRICHERS.

Standard Oil Co., New York City 465
The Sun Oil Co., Pittsburgh, Pa..... 465

COKE CRUSHER.

C. M. Keller, Columbus, Ind..... 465

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City 453

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 453

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 463
Isbell-Porter Co., New York City..... 470
The Wilder Mfg. Co., Phila., Pa 455
R. D. Wood & Co., Phila., Pa..... 470

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City..... 470
Continental Iron Works, Brooklyn, N.Y..... 470
G. Shepard Page's Sons, New York City..... 471
Logan Iron Works, Brooklyn, N. Y..... 472
R. D. Wood & Co., Phila., Pa. 470

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N.Y..... 466

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J..... 466
B. Kreischer & Sons, New York City..... 466
Adam Weber, New York City..... 466
Laclede Firebrick Mfg. Co., St. Louis, Mo. 466
Cyrus Borgner, Phila., Pa..... 466
James Gardner, Jr., Pittsburgh, Pa..... 466
Henry Maurer & Son, New York City..... 466
Baltimore Retort and Firebrick Co., Baltimore, Md..... 466
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 466
Brooklyn Firebrick Works, Brooklyn, N. Y..... 466
F. Behrend, New York City..... 455

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa..... 460

MICA GOODS.

The Mica Mfg. Co., New York City..... 454

BURNERS.

C. A. Gefrorer, Phila., Pa..... 470
Theo. Clough, Dobbs Ferry, N. Y..... 453

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn.... 453

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 463
Greenpoint Chemical Works, Brooklyn, N.Y..... 463
Henry W. Douglas, Ann Arbor, Mich 463

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind 457
Isbell-Porter Company, New York City..... 470
Connelly Iron Sponge and Governor Co., New York City 463

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y. 462
Chapman Valve Manufacturing Co., Boston, Mass..... 462
R. D. Wood & Co., Phila., Pa..... 470
Continental Iron Works, Brooklyn, N. Y..... 470
The P. H. & F. M. Roots Co., Connersville, Ind..... 457
Isbell-Porter Co., New York City..... 470
The Western Gas Construction Co., Fort Wayne, Ind.... 462

ELECTRICAL APPARATUS.

Wm. Henry White, New York City 471

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa..... 456
The American Gas Engine Co., Phila., Pa 467
Backus Water Motor Co., Newark, N. J..... 413

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City..... 454
W. G. & G. Greenfield, East Newark, N. J..... 413

PURIFIER SCREENS.

John Cabot, New York City..... 454

GAS STOVES.

American Meter Co., New York and Philadelphia 459
George M. Clark & Co., Chicago, Ills. 181
Maryland Meter and Manufacturing Co., Baltimore, Md. 474
Keystone Meter Co., Royersford, Pa..... 474
A. Weiskittel & Son, Baltimore, Md..... 455
Detroit Stove Works, Detroit, Mich..... 414

GASHOLDER PAINT.

New York Marine Paint Co., Poughkeepsie, N. Y..... 462

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y..... 462

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md... 460
Continental Iron Works, Brooklyn, N. Y..... 470
Deily & Fowler, Philadelphia, Pa. 472
Davis & Farnum Mfg. Co., Waltham, Mass..... 468
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 468
Stacey Mfg. Co., Cincinnati, Ohio..... 471
R. D. Wood & Co., Philadelphia, Pa..... 470
Logan Iron Works, Brooklyn, N. Y..... 472
Riter & Conley, Pittsburgh, Pa..... 455

GAS SECURITIES.

Gustavus Maas, New York City..... 423
Marquand & Parmly, New York City..... 453

BOOKS, ETC.

Scientific Books..... 473
Field's Analysis..... 464
Digest of Gas Cases..... 465
Directory of Gas Companies..... 473
Practical Photometry..... 466
Coal Tar Genealogical Tree..... 464
Management of Small Gas Works 458
Handbook on Gas Engines 454
Gas Flow Computers 454
Hughes' "Gas Works"..... 454

DIVIDEND NOTICE.

OFFICE OF WELSBACH LIGHT CO., DREXEL BUILDING, PHILA., Mar. 10, 1897.

The Directors have this day declared a dividend of twenty (20) per cent. ($1 per share), payable March 25th, 1897, to stockholders of record at the close of business March 15th. Checks will be mailed.

1135-3 EDWARD C. LEE, Treasurer.

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One used to work of Gas Company. Good reference from New York Company. Address

1137-3 "M.," care this Journal.

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Position Desired

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By a man 34 years of age. Sixteen years' experience in the manufacture and distribution of Coal Gas as Supt., and four years in the Electric line. Thoroughly competent to take charge of any plant, separately or combined. A practical mechanic, and understands the erection of gas plants and everything pertaining to the business. Not afraid of work. Salary no object until ability is proven. Best of references.

1102-tf Address "M. E. J.," care this Journal.

ENGAGEMENT DESIRED,

As Manager or Superintendent of Gas or Gas and Electric Light Works.

Thoroughly competent and reliable. Address

1129-5teow "ENGINEER," care this Journal.

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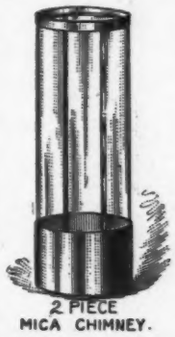

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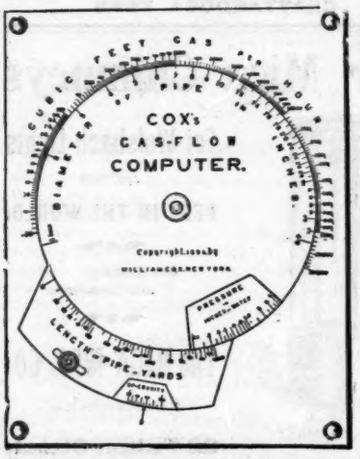

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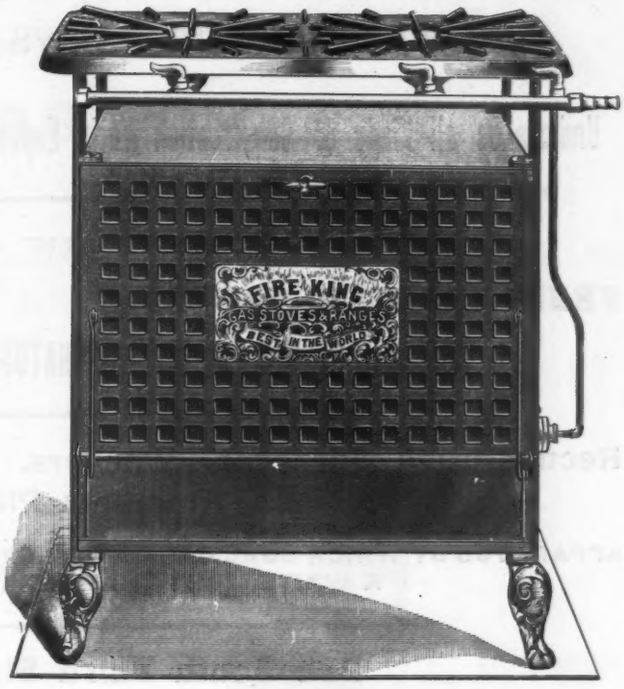

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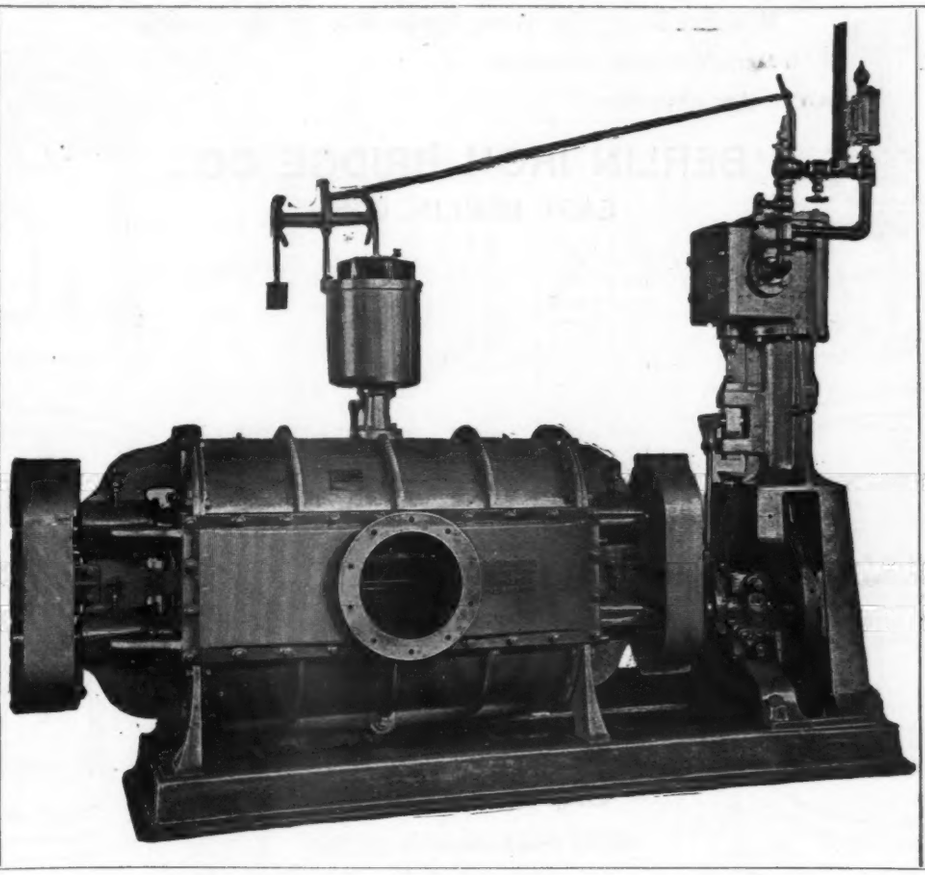

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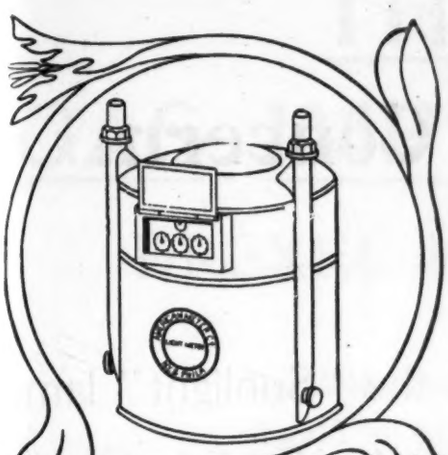

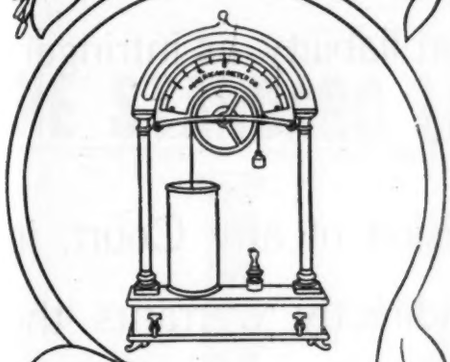

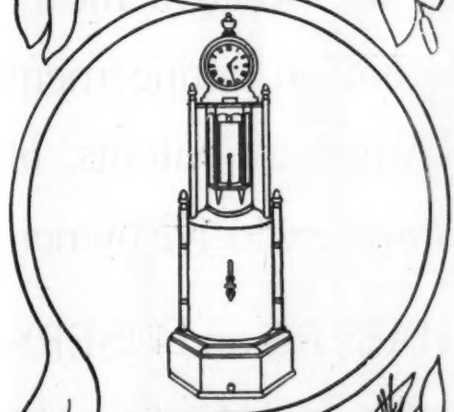

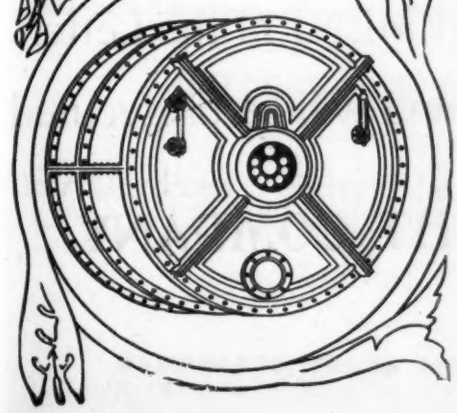

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NEW YORK AND PHILADELPHIA,
CHICAGO, ST. LOUIS,
SAN FRANCISCO.

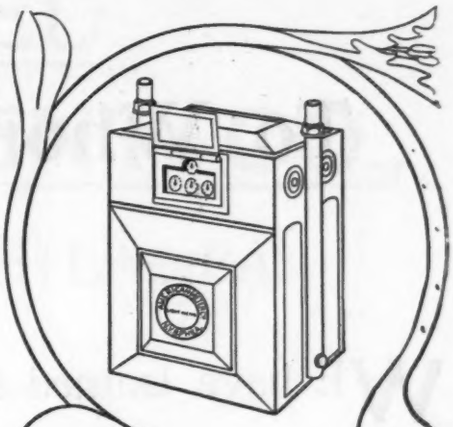
PUBLIC LIGHTING TABLE.

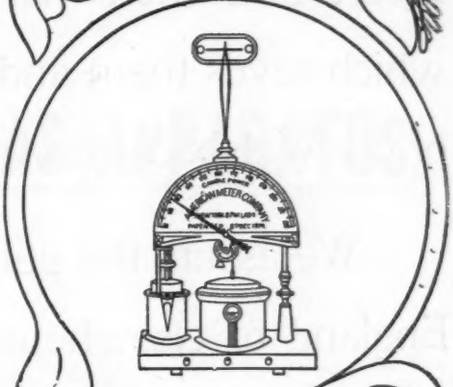
APRIL, 1897.

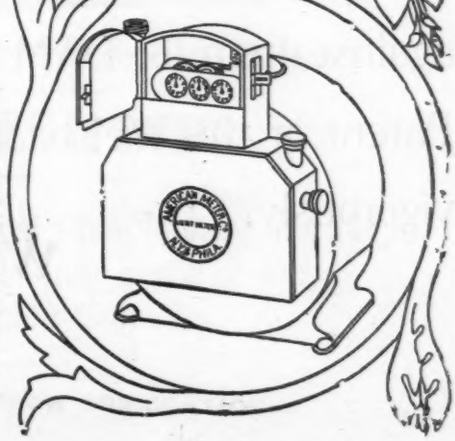
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	6.50 PM NM	4.50 AM	6.10	4.55
Fri.	2	6.50	4.50	6.15	4.40
Sat.	3	6.50	4.50	6.15	4.40
Sun.	4	7.00	4.30	6.15	4.40
Mon.	5	7.00	4.30	6.15	4.40
Tue.	6	10.20	4.30	6.15	4.40
Wed.	7	11.10	4.30	6.15	4.40
Thu.	8	12.00 AM	4.30	6.15	4.40
Fri.	9	12.40 FQ	4.30	6.25	4.30
Sat.	10	1.20	4.30	6.25	4.30
Sun.	11	1.50	4.20	6.25	4.30
Mon.	12	2.10	4.20	6.25	4.30
Tue.	13	2.40	4.20	6.25	4.30
Wed.	14	3.10	4.20	6.25	4.30
Thu.	15	No L.	No L.	6.25	4.30
Fri.	16	No L. FM	No L.	6.30	4.20
Sat.	17	No L.	No L.	6.30	4.20
Sun.	18	7.20 PM	10.00 PM	6.30	4.20
Mon.	19	7.20	11.20	6.30	4.20
Tue.	20	7.20	12.30 AM	6.30	4.20
Wed.	21	7.20	1.20	6.30	4.20
Thu.	22	7.20	2.10	6.30	4.20
Fri.	23	7.20 LQ	2.40	6.40	4.10
Sat.	24	7.20	3.10	6.40	4.10
Sun.	25	7.20	3.30	6.40	4.10
Mon.	26	7.20	3.50	6.40	4.10
Tue.	27	7.20	4.00	6.40	4.10
Wed.	28	7.20	4.00	6.40	4.10
Thu.	29	7.20	4.00	6.40	4.10
Fri.	30	7.20	4.00	6.45	4.00

TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45







To Whom It May Concern.

WE have learned that the makers of the "Sunlight" lamp assert that there has been a decision in the English Courts which saves them and their customers from liability as infringers of the Welsbach patents.

We assure the public there is no decision of any Court, in England or elsewhere, that directly or indirectly warrants the statement or inference that the lamp sold by the Sunlight Incandescent Gas Lamp Company of America is not an infringement of the Welsbach Light as made under the American patents, of which the Welsbach Light Company is sole and exclusive owner.

NOTICE is hereby given to all PURCHASERS and USERS of the so-called "Sunlight" lamp that suits will be brought against them for DAMAGES for INFRINGEMENT of the Letters Patent of the Welsbach Light Company, and will be prosecuted vigorously.

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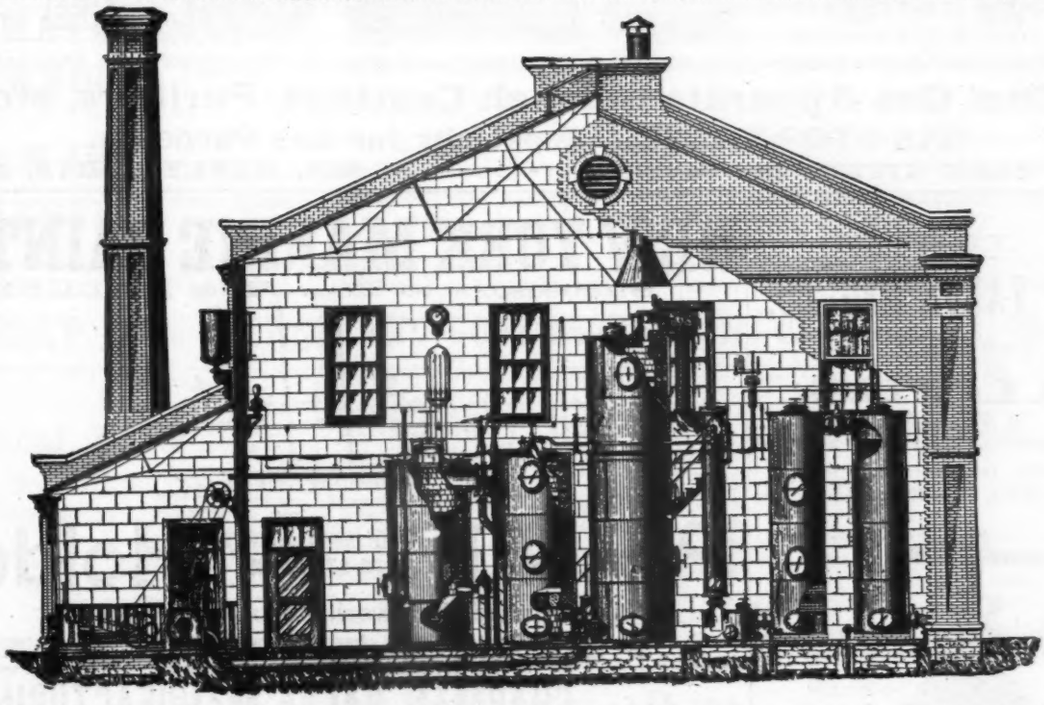

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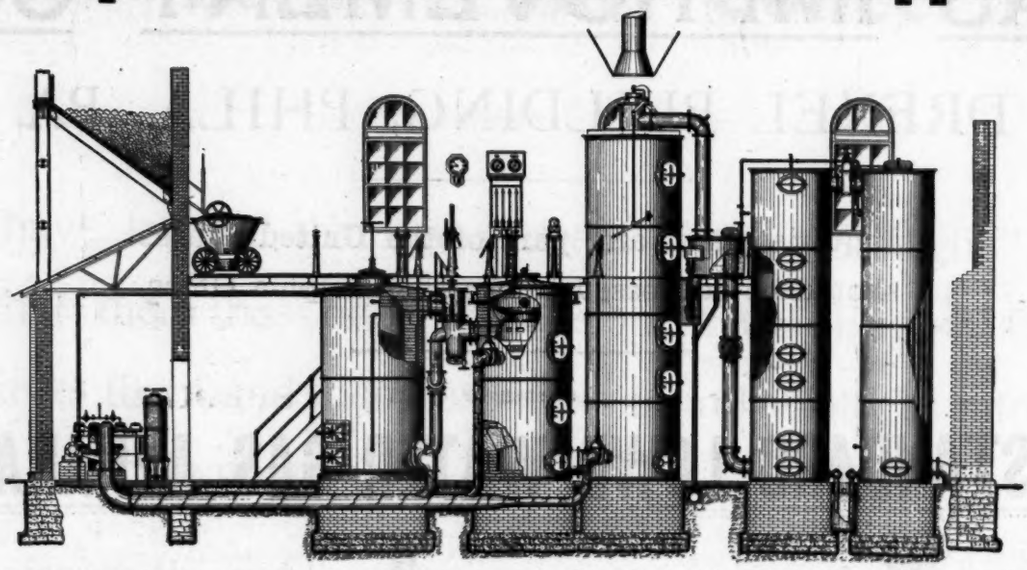

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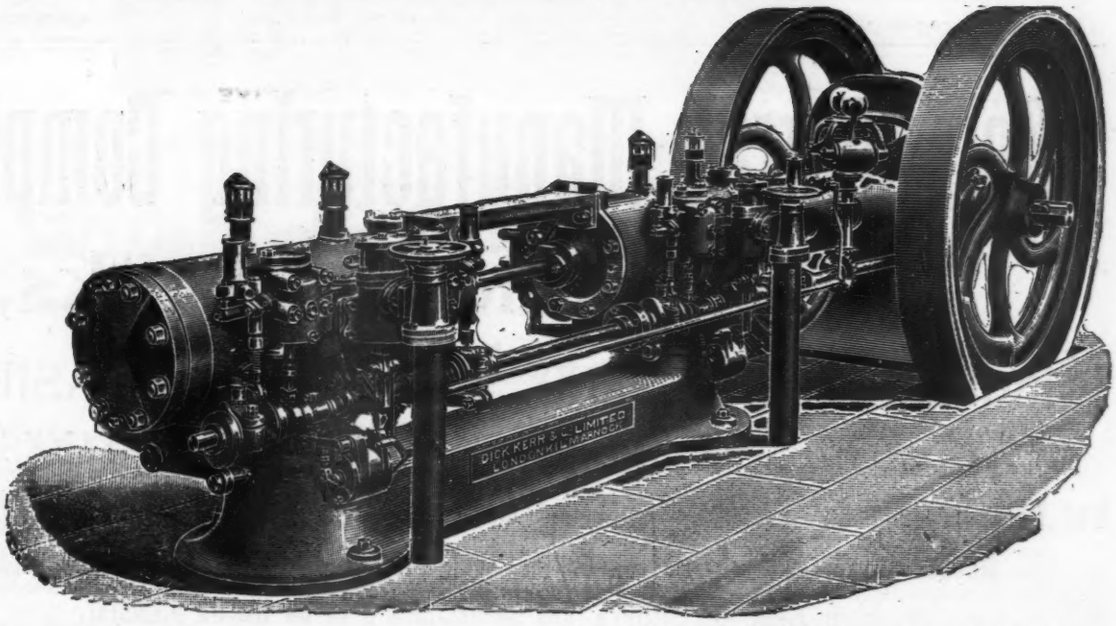

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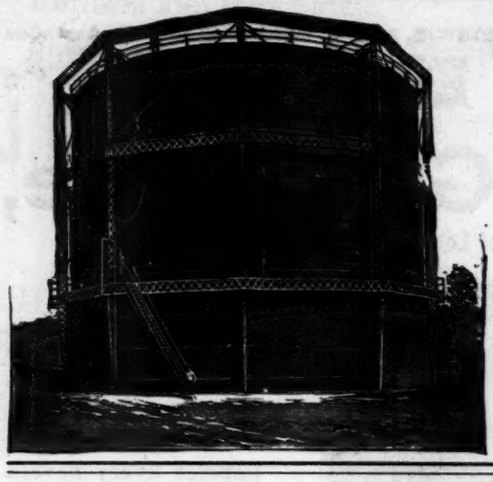

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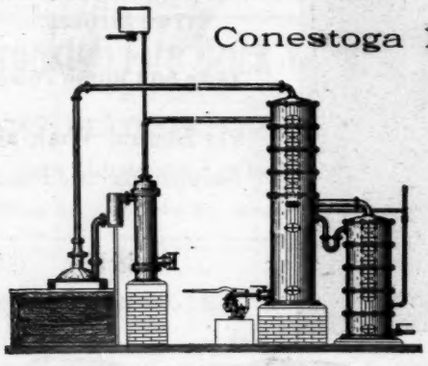

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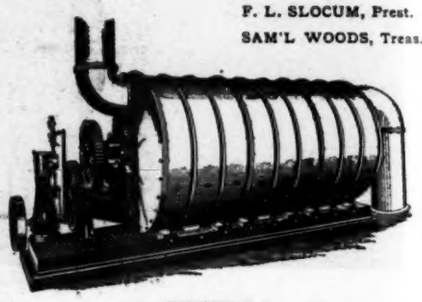

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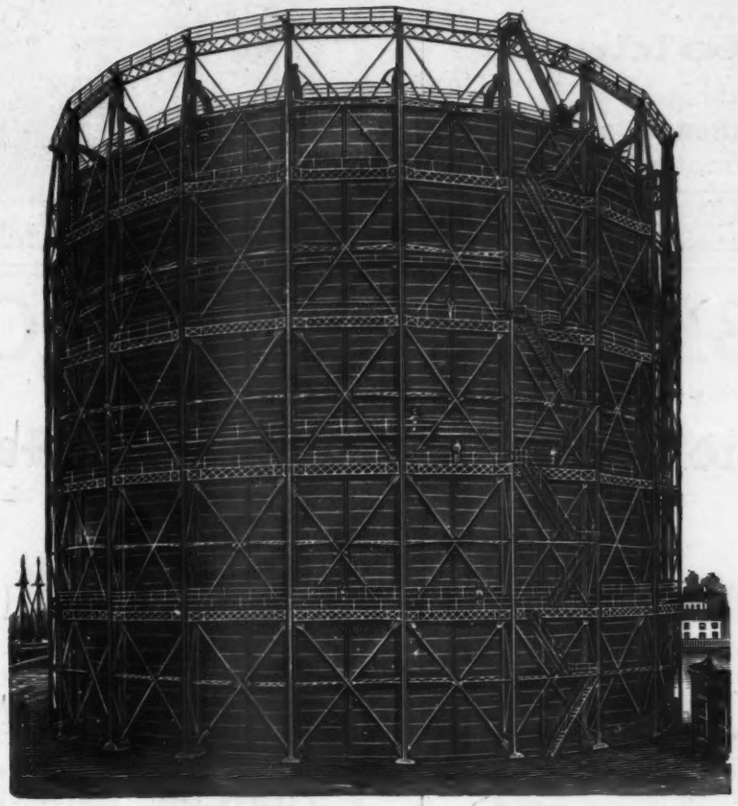

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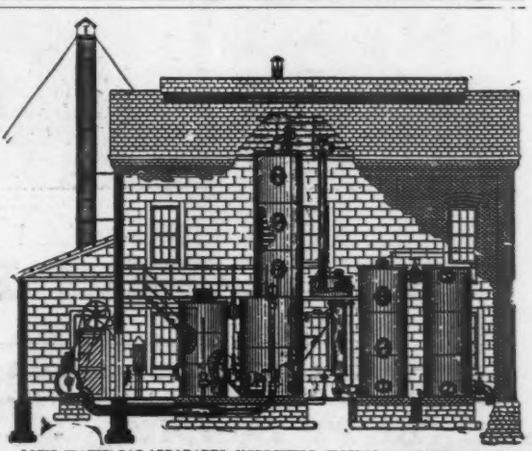

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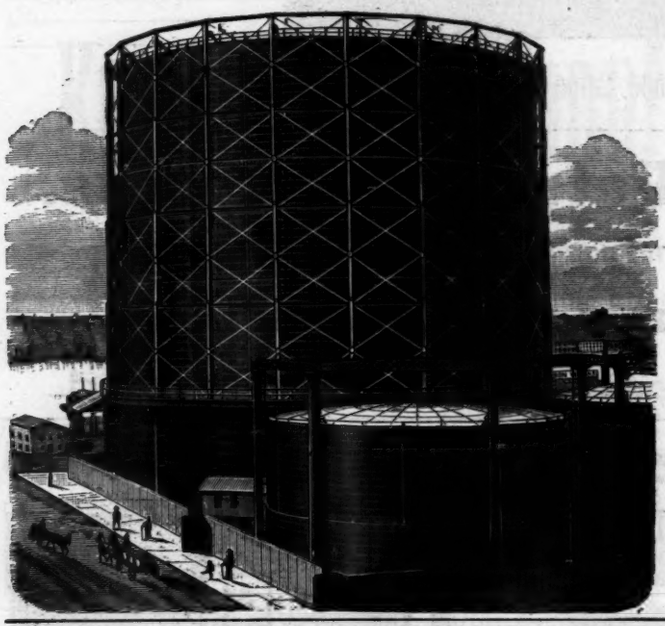

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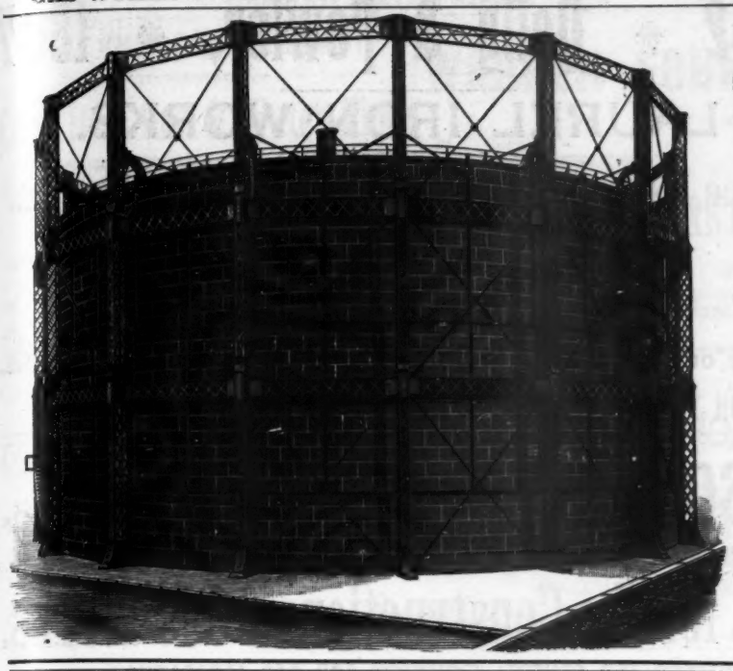

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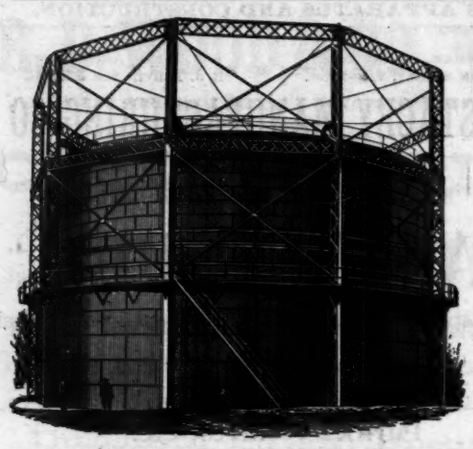

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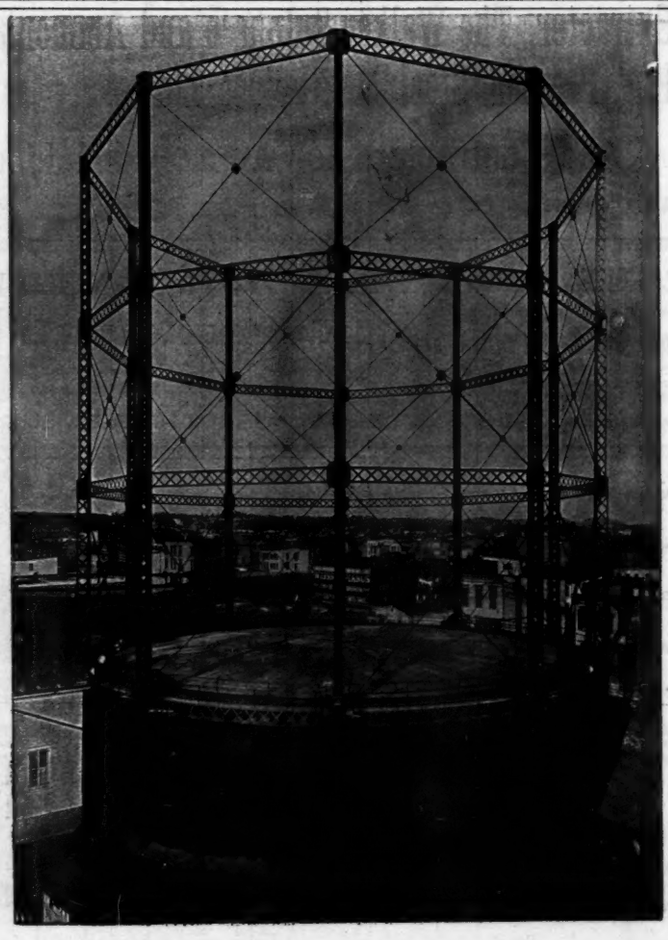

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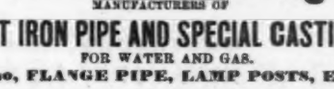

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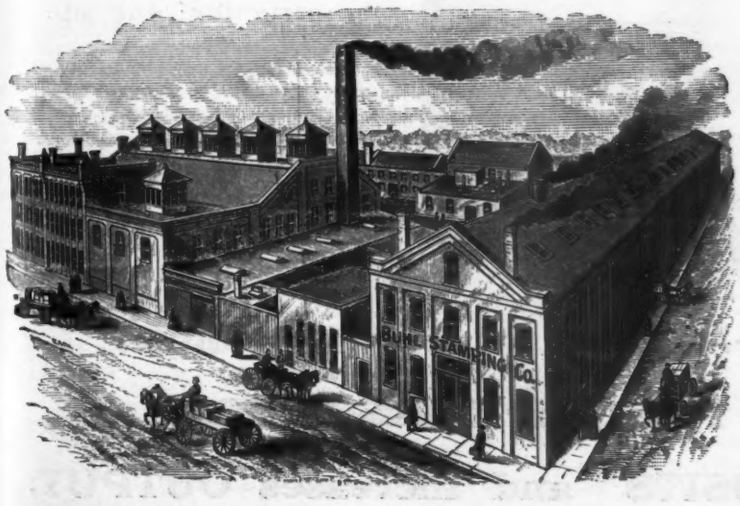

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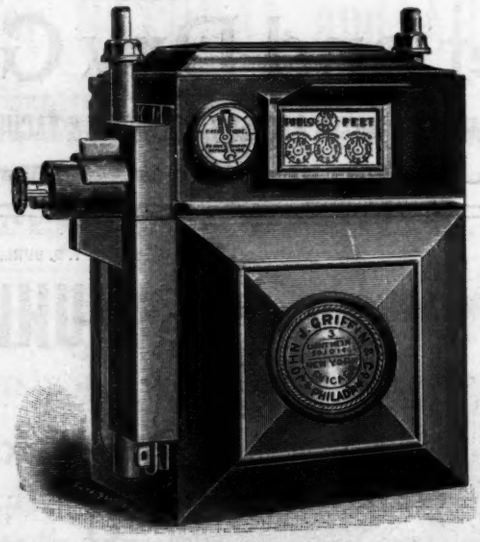

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